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Advertisement Index, see page xxxvi.

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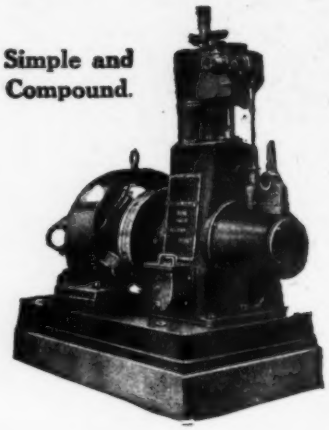

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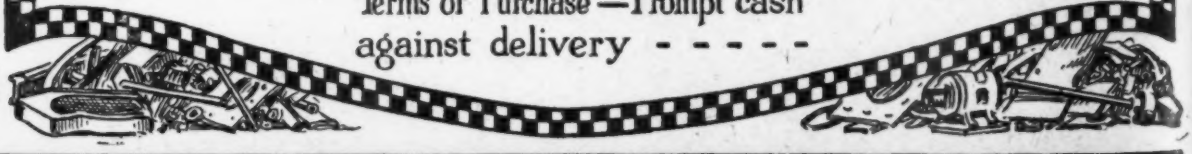

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THE

ELECTRICAL REVIEW.

VOL. LXXXV. NOVEMBER 28, 1919. No. 2,192.

ELECTRICAL REVIEW.

Vol. LXXXV.] CONTENTS: November 28, 1919. [No. 2,192.

	Page
The Electricity Supply Bill	673
The Direction of Industry.—An Important Trade-Union Case	674
Local Authorities and Mains Laying.—The New Wireless Chain	675
Some Summation Methods of Metering A.C. Supplies, by R. M. Longman (*illus.*)...	676
How Code or Telegraphic Addresses are Registered	677
A Useful Voltage Adjusting Panel, by H. K. Whitehorn (*illus.*)	678
The Association of Mining Electrical Engineers	678
Sunco Electric Fires (*illus.*)	679
The Institution of Electrical Engineers (*continued*)	680
Reviews	681
The Electrical Trades Benevolent Institution	682
Correspondence—	
The Electricity Supply Bill.—The New Standards for Cables	682
The Value of the London External Degree.—Speeding-up of an Induction Motor.—Coal Profits and the Government	683
Stopping Runaway Tramcars (*illus.*).—Coil Ignition *v.* Magneto Ignition.—The Wife as a Commercial Asset.—Appointments in India.—Apprentices and Trade Union Restrictions	684
Legal...	685
The Electricity Supply Bill	685
Business Notes	686
Notes...	691
City Notes	695
Stocks and Shares	696
The New Industries in China, by M. Smith	697
The International Motor-Car Exhibition (*illus.*) (*concluded*)...	698
The Design of Multiple-Stage Amplifiers, by C. L. Fortescue, (*illus.*)	700
The Government and Trade	702
Electric Fire Alarm and Police-Patrol Signalling Systems in the United States	702
New Electrical Devices, Fittings and Plant (*illus.*)	703
New Patents Applied for, 1919	704
Abstracts of Published Specifications	704
Contractors' Column ... ... Advertisement page	xxvi

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"ELECTRICAL REVIEW": TIME OF PUBLICATION.

Readers who are receiving their copies of the ELECTRICAL REVIEW a little later than formerly, are reminded that as the result of changes in printing arrangements and in consequence of rapidly increasing circulation, publication recently had to be deferred until Friday afternoon. The REVIEW is now on sale in London at 4 p.m. on Fridays; copies sent by post or obtained through local agents should reach the hands of subscribers on Saturday mornings.

THE ELECTRICITY SUPPLY BILL.

THE Electricity (Supply) Bill having at last left the Committee Room, last week came before the House of Commons in the Report Stage, and is there being keenly debated. Up to the time of writing, the most important change that has been made is the reinstatement of the clause which transfers all the powers and duties of the Board of Trade, under any Act relating to the supply of electricity, to the Minister of Transport—a clause which, as our readers will remember, was removed from the Transport Bill, and was rejected by Standing Committee B by 20 votes to 4. The Government, however, attached the greatest importance to the clause, the omission of which, in its view, would be tantamount to the destruction of the Bill, and the clause was passed without a division.

We have already expressed the view, which is shared by a great mass of the public, that the proposed transfer would not be in the best interests of the electricity supply industry or of the consumers in general. Its effect would be to place the supply of electricity in the hands of one of the consumers—one whose claims are estimated at one-fifth of the output, and who is in the very act of reorganising his household, a process which, in view of the muddle it is in, will occupy him for years.

Mr. Shortt, in moving the clause, damned private enterprise with faint praise, remarking that it had done very good work in difficult circumstances. It is unfortunate that, however misguided a Government policy may be, the authors of that policy are never called to account for their blunders; a Government never accepts responsibility for the follies of its fore-runners, and, consequently, the present Government, in the person of Mr. Shortt, can blandly refer to the "difficult circumstances" created by the faults of his predecessors without a twinge of conscience. But the point is that the Governments which created those difficulties, in defiance of the opinions of electrical men at the time, believed their actions were necessary and salutary—in just the same way, the present Government insists on placing the supply of electricity under the thumb of a railway manager as a fundamental condition without which success is unattainable, regardless of the egregious failure of former Governments to discriminate between a good and a bad policy.

In short, we decline to regard the unsupported opinion of the Government as an argument in favour of the proposed transfer; bitter experience warns us to beware of ministerial fiats. We look to the country for guidance, and we see the Institution of Electrical Engineers, the Incorporated Municipal Electrical Association, the Association of Municipal Corporations, and the leading local authorities, unanimously opposed to the railway monopoly, and we believe that their views are far more worthy of acceptance than those of any Government department.

The contention that the Board of Trade has no adequate staff to administer the Act is of no value—neither has the Minister of Transport. The latter, said Mr. Shortt, would have highly skilled engineers, but it is ridiculous to suppose that the same men can deal with the problems of transportation, the problems of electrification, and the problems of public electricity supply. The Ministry will have plenty of work to occupy the attention of its expert staff without adding to it the heavy task of organising electricity supply. As a matter of fact, the Electricity Commissioners will form a practically separate department no matter which department they are under (Sir Eric Geddes himself insists that the Chief Commissioner absolutely *must* be independent), and hence Mr. Shortt's contention has no point.

Sir Auckland Geddes loyally supported the scheme of distributing "rivers of power" along the railways for the use of the railways, and from these rivers "branches of power" for industrial purposes, thus unconsciously bearing out the argument of the opponents of the transfer that the railways would come first. His brother further indicated the fact that electricity supply would be promoted along railway lines, so to speak, when he persisted in likening the various voltages and frequencies to "gauges." He wants an unmixed "gauge," and he showed that he regarded the subject through railway-coloured glasses when he developed the argument that since the electrification of a railway involved the sinking of a large fixed capital, in the interest of transportation they must develop industry, in order to get a good load factor and a dense traffic on the railway. Note well that he is not out to develop transportation for the benefit of industry—he explicitly proposes to develop industry for the benefit of transportation. But the Board of Trade Committees recommended the development of industry as the first and greatest need, which all will recognise it to be. We cannot export transport. "Production" is to be our slogan, and transportation should be an auxiliary to that aim, not the prime motive.

We read with interest that electrification schemes are under consideration for the Midland, Great Eastern, South-Eastern, and Brighton Railways—that is very satisfactory; the urgent necessity of bringing these lines up to date in the metropolitan area needs no demonstration. But that is no reason for placing the interests of the whole of the electricity suppliers and consumers of the country—and with them the interests of the whole nation—under the control of a department not concerned with the production of any commodity.

A renewed attempt on the part of the local authorities to secure a statutory majority on the Electricity Boards was defeated by 153 to 54, and provision was made for recourse to arbitration in cases where the Commissioners were satisfied that the "standard price" would work an injustice to a company, while another amendment gave to local authorities the same terms as the companies. The Bill is down for third reading as we go to press.

The Direction of Industry.

Surely what the Government ought to have done, as soon as they had admitted the principles of the Whitley Reports, as they said, as one of the main parts of their future reconstruction policy, was to begin with an important industry like the railways. The Railway Executive ought to have been no longer a body of railway managers alone, but a joint industrial council of the railways on which the railway management had their place, but sitting along with them in council, dealing with the difficult constructive problems that arose during the war, would have been Mr. Thomas, Mr. Cramp, and the other leaders of the men employed on the railways. In my view, if that joint constructive work had been done through the war period, what we have seen in the last nine days would never have happened.

The words are those of the Right Hon. J. H. Whitley, M.P., Deputy Speaker and Chairman of Committees of the House of Commons; and the occasion of their utterance was at Manchester in October, when Mr. Whitley delivered the first of a series of lectures on Industrial Administration, arranged by the College of Technology.

Mr. Whitley stated that there are now 46 Joint Standing Industrial Councils in existence, representing 2½ million workpeople. The principle of the Industrial Council has not yet been applied to agriculture, engineering, mining, or the railway services. The state of organisation in the agricultural industry is notoriously backward, and there are difficulties, mainly, we believe, on the side of the trade unions, as regards the engineering industry; but the remaining two, mining and railways, are controlled, if not actually administered, by the Government, and it is here that a shining example might have been created which would have given light and leading to other sections of the industrial community. Mr. Whitley's words speak for themselves; the Government is greatly to blame for not having applied those principles which it acclaimed, almost with enthusiasm, and adopted as part of the industrial policy of the nation as long ago as March, 1917, to those industries which were directly under Government control, and nearest to hand.

Once again, however, we must point out that nothing is told us as to the intentions of the Government with regard to the trained staff through which industry is, and alone can be, administered. None but organised bodies of employed persons can be represented on the Whitley Committees, and until trained staff men are organised they can, as such, have no part in those Committees. If and when the organisation of such men is completed, what is then to be the position? If they are represented merely in relation to their numbers, they will take their seats on the Industrial Councils in the proportion of one trained man to several hundred manual workers. There seems to be a very serious danger that a staff union would necessarily be so small numerically as to be ignored by the great trade unions, and it has already been made clear that the employers do not regard the technical men as belonging to their camp. Thus it appears as if the trained brainworker is to be left out of the calculations of Capital, of Labour, and of the Government. Some of the more vocal of labour propagandists have expressed the view that the staff men, as employed persons, must join manual workers' unions, and that they cannot expect any greater representation than the proportion to which they are entitled in respect of the number of persons embodied. We have said that the employers do not regard the technical men as belonging to their camp, and in one sense they do not. They do not want to sit down on the same side of the table with staff men who represent staff men alone. There is another sense, however, in which the employers regard the staff men as being on their side, and it is as certain as anything can be that they will expect their interests at some stage or another, if not at all stages, to be represented by those men.

For the existence of this view, in the first place, the brainworkers have no one to blame but themselves. They have patiently acted, time and again, as the catspaw of the employer in his dealings with organised labour, and the employer has naturally come to believe that this (for him) most fortunate state of things will continue indefinitely. But of gratitude for, and appreciation of, such action there is no sign; and it is not long since the representative of an important section of the trained men was told to run away and play with Mr. Henderson, and not to try to associate with his betters.

In this state of confusion it cannot be matter for surprise that the technical man begins to wonder where his duty really lies. It is one thing to be told he is a fine fellow, of undoubted loyalty, and invited to stoke a locomotive or be a citizen guard, and another thing to be told that his place is in outer darkness, and this, as we have shown, by both parties.

It is the Government, and the Government alone, that can, and eventually must, redress matters. The trained administrators of industry are part of the State, and will, we are confident, do their duty to the State, always, and possibly a great deal more faithfully than either Capital or Labour. The representatives of the State, therefore, after full consideration and inquiry, must provide for them that place in industrial organisation which is their right and their due, and which they alone are competent to fill.

An Important Trade-Union Case.

In the case of Davis *v.* Thomas which was heard on November 3rd, a principle was laid down which appears, at first sight, to put a powerful weapon in the hands of Trade Unions. A man was dismissed from his employment, with a month's notice, at the instance of certain members of a Trade Union to which he belonged. No improper means or threats were employed to bring about the dismissal. It was held that no action lay. Mr. Justice Lawrence held that a person who induces another to do an act which is not wrongful so far as that other is concerned can only be made legally responsible for its consequences if he has procured his object by the use of illegal means; and this proposition equally holds good when the inducers are a combination of persons, at all events where the combination is formed for the purpose of protecting the common trade interests of the combining persons, and the act procured is incident to that purpose.

This appears to be a somewhat formidable doctrine; but it is really old law stated in a new way. That anything in the nature of *illegal means* may be restrained was clearly laid down in another recent case, Valentine *v.* Hyde ((1919), 2, ch. 129). There it appeared that a local Joint Council of Unions whose members were employed in various branches of colliery work desired to compel an old member of the Amalgamated Society of Engineers to join one of these local Unions. This would have involved the loss of his existing claims to benefit—claims which he could assert, owing to his having paid contributions for many years. They threatened to obtain his discharge by his employer unless he carried out their wishes. He claimed an injunction. It was contended that no action lay, because what was done was done in the course of a trade dispute. Mr. Justice Astbury found that the pressure exerted on the employer amounted to coercion, and granted the injunction asked for. After giving a useful summary of the leading authorities his judgment proceeds to the decision of two practical points. First, the question of fact whether persuasion used in a particular case amounts to coercion is not governed by any such hard and fast rule as that specific threatening language must be proved. It is a matter of reasonable inference from the position of the parties and the whole of the circumstances. Secondly, not every dispute between workmen and workmen is a trade dispute within the meaning of the Act. Where, as in this case, the dispute has nothing to do with terms of employment or conditions of labour, it remains under the common law.

This may be said to be a narrow construction of the celebrated Trade Disputes Act, 1906, which was designed to put the Trade Unions above the law; but if the facts of this single case are carefully considered, any other decision would have been harsh in the extreme. Commenting upon the case in the October number of the *Law Quarterly Review*, Sir F. Pollock says:—

> If anyone thinks this a narrow construction of the Trade Disputes Act, we say that a statute which makes of employers and workmen a special class excepted from the general law should, according to all sound principle, be strictly construed; but this without admitting that Astbury J. has gone beyond the natural and reasonable interpretation of the words "connected with the employment or non-employment, or the terms of the employment, or with the conditions of labour, of any person." In a general way the facts resemble those of Allen *v.* Flood. The difference is that there, on the facts as found, there was only a warning given by a person who had no power to control the event, but here the communication to the employer amounted in substance to a threat uttered by persons having both will and power to execute it.

It is significant that although the case was heard in March, 1919, there was no appeal from the decision of Mr. Justice Astbury.

Local Authorities and Mains Laying.

Public utility companies, such as those supplying gas, electricity, and water, will find much to interest them in the proposals which are now being put forward with regard to the consolidation and amendment of the highway law under the Ministry of Transport. As legislation is promised on this matter in the not far distant future, it may be well to call attention to what is in the minds of the various county surveyors and engineers throughout the country with regard to the conditions which should attach to the laying of supply mains in public roads, this matter having received some attention at the Roads Transport Congress organised by the County Councils' Association in connection with the Roads and Transport Exhibition at the Agricultural Hall, London.

In a paper read before the Congress on Saturday, November 22nd, Mr. H. Hampton Copnall, Clerk to the Notts County Council, who is an acknowledged authority on highway law, sketched out the draft of a proposed Bill for consolidating and amending the highway law as it now stands. In this he proposes to give full control to the highway authority over gas, electricity, and water mains. He lays it down that the highway authority shall have full control of the subsequent reinstatement of the road and have the option either to do the work itself or to require the undertakers to do the work and carry out the reasonable directions and requirements of the highway authority Where the undertakers do the work themselves, they should be required to maintain the surface which they disturb for twelve months after the final reinstatement.

During the discussion on the paper it was pointed out that gas and water mains were at present controlled by an Act of Parliament passed in 1847. Mr. Drylands, the County Surveyor of Surrey, contended that public utility companies should be compelled to restore the surface of the roads which they disturbed to a condition to carry the traffic, no matter what that might mean in expense to the companies, even if it meant laying the mains in concrete. Mr. Martin, of Salford, suggested that there should be standardised positions for the various classes of mains under the roadways, so that damage would not be done to the roads, as was often the case now, in trying to find where a particular main was.

Another matter bearing on the question of mains under highways is the possibility of the building of roads on a different form of construction from that generally adopted at the present time. Great attention is now being paid to the construction of concrete and reinforced concrete roads, many thousands of miles of which exist in the United States and other parts of the world. Though at the moment it may be said that there are differences of opinion between county surveyors on this matter from the general traffic point of view, experiments have been, and are being, carried out by the Road Board, and it is evident that if this class of construction is adopted, it is not intended that the roads should be continually broken up for laying mains. The view appears to be that special tunnels will have to be constructed for carrying mains. In any case, public utility companies should watch this proposed legislation.

The New Wireless Chain.

The announcement that the Government has appointed a Committee to advise it on Imperial wireless communication, and to prepare a complete scheme, will be received with mixed feelings by the public, and especially by those who have suffered at the hands of the Government in this matter. The Committee contains many distinguished names, but not one professional expert experienced in the class of work upon which it is to be engaged. Presumably the eminent gentlemen of whom it is composed will give their services to the Government, and we honour their patriotism, while we "despise their judgment," as the Western farmer said when his bull-calf charged the locomotive. When will our scientists learn that knowledge is worthy of its hire? It is this practice of gratefully accepting the opportunity to work for nothing that has made the scientific investigator and the engineering expert objects of disdain to the Civil Service, and has taught the latter that scientific advice need not be paid for.

And now what is this Committee going to advise the Government to do? To erect high-power stations with the aid of the Post Office staff? Or is the job to be given to the Admiralty? We know these Government Departments—how they work, and how they husband the resources of the nation; how they provide land telegraphs—at a price—and how they conduct the telephone service—and we can imagine how they will carry on a world-wide wireless service. Indeed, the wireless record of the Government, and especially of the Post Office, is a ghastly tale of blunders, evasions, scandals, and double-dealing such that we should not have supposed any Cabinet would care to stir up the mud again. But, as we have remarked elsewhere, it is always a new Government, which is not responsible for the mistakes of its predecessors, and which wears the white flower of a blameless life when it starts work—not for long.

The original contracts should have been carried out, without delay and without political mud-slinging; then we should have had an Imperial wireless service at work during the war, and justice would have been done. Now, of course, in view of what has passed, every effort will be made to flout the British wireless company to which we owe so much of our success in wireless telegraphy in wartime, and the Post Office will proceed to "muddle through" in its own inimitable way, with the help of amateur advice, gratis.

SOME SUMMATION METHODS OF METERING A.C. SUPPLIES.

By R. M. LONGMAN, A.M.I.E.E.

The supply to large consumers is often given by means of two or three feeders or panels, only one or all of which may be in use at a time. It is generally desirable and often necessary, *e.g.*, when it is on a demand tariff, to meter the whole supply on one meter. In some cases this has been done by arranging a meter panel as a connecting link between the supply authority's feeders or switchgear and the consumers as in fig. 1.

Another method sometimes adopted is by means of two sets of busbars, one for the supply feeders generally situated about the middle of the switchgear, and another set of bars extending on both sides of the former for the consumers' circuits, the coupling of the two sets of busbars being done through a meter panel as in fig. 2.

Both methods have their merits. No. 1 is very simple, and allows of additions to either the feeder panels or the consumers' panels, but the total current has to traverse a part of the busbars, and for heavy-current jobs No. 2 is rather a better arrangement, but unless provision is made at the start for additions to the feeder panels, this is rather awkward.

Neither of the above types, however, permits of any sectionalising arrangements, which are very desirable so as to allow of one part being made dead at a time to carry out cleaning, overhaul, repairs or extensions. In many large undertakings, *e.g.*, mines, steel works, shipyards, &c., it is most difficult to arrange for a complete stoppage of the supply in order to carry out repairs, overhaul, or extensions, and it is most important that some sectionalising be provided for. It is for such supplies as these that the following arrangement of metering has been devised, it being applicable to either high or low pressure. In this scheme the supply panels, whether they are feeders or transformers, or even generators, are all equipped with the same ratio meter current transformers, and if it is an H.T. supply, similar ratio potential transformers—all of which feed on to one meter, as shown in figs. 3 and 4. It was first intended to have auxiliary switches or plugs in the secondary current circuits as well as in the potential secondary circuit, but this was found to be a rather unnecessary refinement, as the effect of a dead C.T. secondary connected in parallel with a live C.T. feeding a meter coil was quite negligible—as long as too many meter coils or instruments were not included in the meter circuit. When supplying an ordinary integrating meter the effect of one dead C.T. is much less than 1 per cent., provided that the current transformers used are of good design, and have at least 600 ampere turns.

If it is required to insert instruments for each panel on the same C.T.'s, these must be connected into the current circuit before reaching the summation meter. In most cases an ordinary 5-amp. coil meter will do for the summation meter as generally when a duplicate supply is given, either is large enough for the full load—but should there be more than two supply panels requiring two on at once and both nearly fully loaded, the summation meter could be fitted with 10-amp. coils, but with a dial train suitable for the ordinary C.T. and P.T. ratios.

The pressure circuits for the meters can either be supplied by means of relays so arranged that the relay on the supplying panel closes the meter potential contacts, or by means of the auxiliary switches shown in fig. 4, which is a more positive and certain method than by a relay.

There are a few points in connection with the potential switches on a high tension supply which require special notice. The potential transformers are situated on the dead side of the switch, and only made alive when the main switch is closed. The auxiliary potential switches are naturally on the L.T. secondaries of the P.T.'s. Fig. 4 shows the wiring diagram for two such panels and also includes the special test block.

The four point plugs in the pressure circuit are required for bringing the potential circuits to the switch handle mechanism, and also for isolating purposes. The test block TB is provided for the rapid and safe insertion of a checkmeter or other instruments for testing purposes, and is a most necessary piece of apparatus where regular checking of meters is carried out.

For a 3-phase P.T. two auxiliary switches only are required, one each for the red and blue phases, for as a rule one phase—the white—is earthed.

Auxiliary switches or some means of disconnecting the dead P.T. from the live one are essential, otherwise the supposedly dead panel is made alive backwards through the P.T.'s—a very "deadly" thing to do. For this reason the auxiliary switches in one well-known type of ironclad switchgear are incorporated in the switch handle mechanism in a

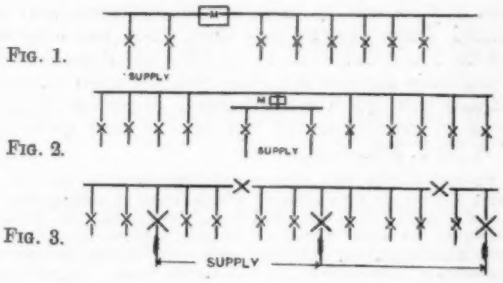


Fig. 1.

Fig. 2.

Fig. 3.

similar manner to the switch tripping circuit, but with one difference. For the switch tripping circuit, the contact must be made before the H.T. switch contact is made, so as to be ready to trip the switch should it be necessary (due to a fault, &c.) immediately the H.T. circuit is made, but the auxiliary potential contacts must *not* make circuit until after the H.T. circuit is made, or it would be making the in-coming P.T. and the panel alive backwards from the running P.T., and generally would cause the L.T. fuses to blow. This method of summating the supply has incidentally assisted in the arrangement of switchgear and greatly facilitates extensions—it is no longer necessary to bunch the supply feeders together, but they can be distributed along the switchboard with sectionalising switches inserted and added to as the supply grows.

It must be pointed out, however, that this method is not recommended, and should not be used, under conditions where the flow of current or transmission of power is not in the same direction on all the panels so equipped, that is, it will not be very accurate when differentiating instead of purely summating owing to phase angle effects.

An alternative method to the above is by means of printer-meters on each panel—the prints to be synchronised, which is best done by using one time switch to operate the lot, carefully timing and dating the charts, entering each in a book in consecutive columns, adding the records of all together, and thus obtaining the total load and demand and the maximum demand.

This involves a considerable amount of clerical work, with its attendant chances of error, and in the writer's opinion, is not so reliable or such a good engineering job as the above system.

The summation meter may be an ordinary meter or one fitted with a demand indicator or a printometer.

In a rather special case in hand these summation meters are being installed in two sub-stations some distance apart, and a summation of both is to be made—a full description of which it is hoped to publish at a later date.

Another method of summating two supplies which may be at different phase or voltage is by using a 2-element meter with each element connected as a balanced load meter, one being connected to each

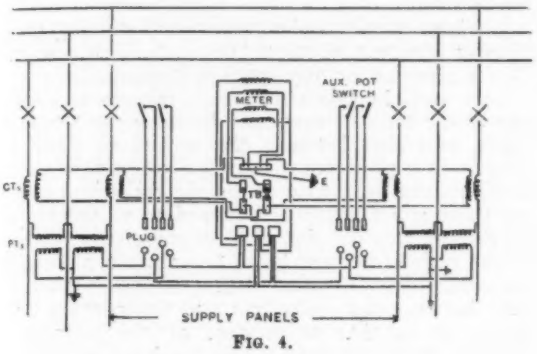


Fig. 4.

supply. In such a case, the gearing ratio must be the same for both supplies—this is quite simple if the C.T. ratio × P.T. ratio of No. 1 supply = C.T. ratio × P.T. ratio of No. 2.

Example.—Take a 10,000 v. and a 2,000 v. supply.

No. 1 C.T. 20/5 × P.T. 10,000/100 = 400.
No. 2 C.T. 100/5 × P.T. 2,000/100 = 400.

In cases where it is desired to summate panels in which the C.T. ratios differ, probably the best method is to make up special meter transformers having the same number of primary windings as there are panels, and one secondary winding to supply the meter current coil.

The number of turns on the primary windings of this intermediate current transformer must be proportional to the ratios of the actual C.T.'s on the panels.

This is a very convenient method of obtaining the total output of a number of machines—the potential being obtained from the busbars, instead of using the special auxiliary switches on the main switches.

It is most unfortunate that such methods cannot be applied to D.C. metering, as summating on D.C. circuits is a very difficult and costly matter.

HOW CODE OR TELEGRAPHIC ADDRESSES ARE REGISTERED.

A Change in the Policy of Private Telegraph Companies.

While State telegraph departments of all countries have, in return for a varying annual charge or rental per address, been prepared to register telegraphic addresses for the public, commercial telegraphic undertakings adopted the policy of registering them free, placing no limit on the number of such addresses any one firm might have. Since October 1st, however, a change in policy has occurred, as telegraph companies in America since that date will not register more than one address for any one merchant or firm, and then only in return for an annual charge of $2.50 for a local address and $5.00 for a reversible address. This no doubt is the result of the Government control during the war of all lines and cables in the United States, as they were impressed with the amount of waste labour entailed in work common to all companies and costing a very large sum of money per annum. When any abbreviated address is offered for registration, the company to which the application is made has to compare the word carefully with those already on its books to make sure it has not been entered already, or is sufficiently dissimilar from any registered. Then the word is entered on a special form which is circulated to all other companies to make sure it will not clash with any they have, and if approved by them, the company concerned is free to register it. In the case of reversible addresses, the companies have to exchange free messages over the cables or landline before they can be registered. This work makes it necessary to maintain a special trained staff, and besides involves a large outlay for expensively bound ledgers, cards, cabinets, accommodation, &c. It will be seen that the privilege of having registered telegraphic addresses is a saving to the public, and besides the cost already referred to, a loss to telegraphic undertakings.

When cables and landlines were not so pressed as they are now, the telegraph companies did not mind conferring this boon on the public, as it was their policy generally to accord all facilities possible, but now that everything has increased in cost so abnormally, it has no doubt become necessary to reconsider the position and put the house in order. The public are perhaps not aware or do not appreciate the large amount of matter the companies have to send free of charge in addition to the privileges above described. The public have not to pay for the number of the telegram, the prefix, the number of words contained in the message, the time and date of filing, routing instructions and station of origin, and if the huge number of telegrams, amounting to many millions handled in a year all over the world is borne in mind, some conception will be had of the vast loss incurred by telegraphic enterprises on this account.

Besides the above, free service matter in connection with telegrams such as repetition of doubtful or mutilated words very often the fault of senders, in connection with non-delivery, usually the fault of either sender or addressee, &c., &c., has to be transmitted. In view of all this, might it not be admitted that telegraphic undertakings are not as rapacious as it is sometimes believed, especially in view of the sensible reductions in rates made? Generally, the performance of so much unproductive work must be of grave concern to the management, and must force it to look askance at any proposal for a further reduction of charges.

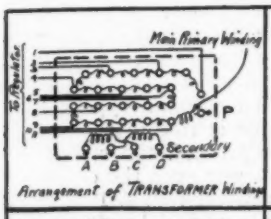
The companies in America—there is no Government telegraphic service—have agreed to the formation of a Central Registration Bureau in a neutral building, where the master set of registrations will be kept and lists of new registrations, alterations, &c., will be supplied to the companies, who will maintain a set in their own offices. The staff for the bureau will be selected from employés of all companies concerned. The scheme will have the advantage not only of cutting down considerably the large number of existing registered addresses, many of which are never used and have been registered because no cost was involved, but also of saving delay in the delivery of any telegram to a registered address not in the books or on the cards of the company by whose system the telegram is sent, as instead of sending inquiries to others, it will be able to refer to its own complete and full set of registrations.

In Great Britain there is little likelihood of the formation of a Central Bureau on the same lines as in the United States, conditions here being different, as registration of code addresses in return for an annual fee is undertaken by the General Post Office.

A USEFUL VOLTAGE ADJUSTING PANEL.

By H. K. WHITEHORN.

In all testing of alternating-current machines, it is necessary to take readings at various voltages, and a simple means of obtaining a wide range of voltage is a great asset to a test bed.

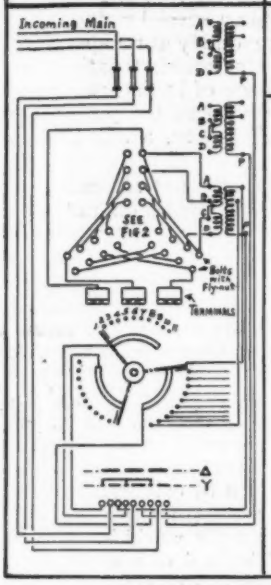


SUBMERSIBLE MOTORS L^TD

SOUTHALL – MIDDLESEX – ENGLAND.

TIME 1912.

Diagram of Connections of Test Transformer Panel & Voltages obtainable.



Voltage Range 3 Phase	Possible Output H.P.	Primary & Sec.y Connections. Primary	Secondary
115 - 145	30	Y	A
200 - 250	30	Y	C
200 - 250	60	Δ	A
230 - 290	30	Y	B
305 - 380	30	Y	E
350 - 430	30	Y	F
350 - 430	60	Δ	C
400 - 500	30	Y	D
400 - 500	60	Δ	B
530 - 660	60	Δ	E
600 - 750	60	Δ	F
700 - 875	60	Δ	D

Fig. 1.—Scheme of Connections.

Herein is described an arrangement used for the past seven years by Submersible Motors, Ltd. (Southall), which has proved to be excellent in every way.

In fig. 1 is shown the general scheme of connections for a three-phase panel, and the tabulated voltage range obtainable.

Three 18-K.V.A. single-phase transformers are employed, the primary (P), wound for 415 volts, which has also several end tappings representing 20 per cent. of the windings; the secondary is double wound, consisting of two exactly similar sections (AC and BD) wound for 200 volts each. The three-phase supply passes through the star-delta switch, through a three-arm regulator, on to the primary windings. The terminals of the secondary winding are connected to studs on the panel which can be connected by the links shown in fig. 2 to any of the various arrangements shown in fig. 3.

By this means, assuming a 415-volt supply, the voltage applied to the primary is 240 for the star position of the star-delta switch, and 415 for the delta position; and if the two secondary sections are connected in series the combined voltage (A to D) will be:—

230 to 290 for the star position of the star-delta switch;

400 to 500 for the delta position of the star-delta switch.

The exact voltage depending on the position of the regulating arm between position I and position II.

It will be seen that a total range 115 to 145 volts and 200 to 875 volts can be easily obtained, and the panel would be very useful for such tests as:—

1. General tests on induction motors and A.C. apparatus.

2. Light running and iron loss tests at different voltages on transformers, and on induction motors, &c., from low voltage up to 25 per cent. above normal voltage.

3. Short circuit, locked rotor, and starting torque tests at different voltages, up to as high a voltage as the machine or apparatus will stand.

Care must be taken that the wiring is of suitable size at the back of the panel between the secondary studs, and also between the secondary studs and the two-hole plug terminals. It must be remembered that between each position on the three-arm regulator there is a voltage corresponding to the tapping on the primary winding, and consequently the arms of the regulator must be of the same form as used on battery control panels with a suitable small resistance between the main arm and the contact finger beside it, so that adjustment of the voltage can be made while the panel is alive without interrupting the test.

The writer's thanks are due to Submersible Motors, Ltd., for permitting this article to be published.

A larger installation on similar lines to the above is now under consideration.

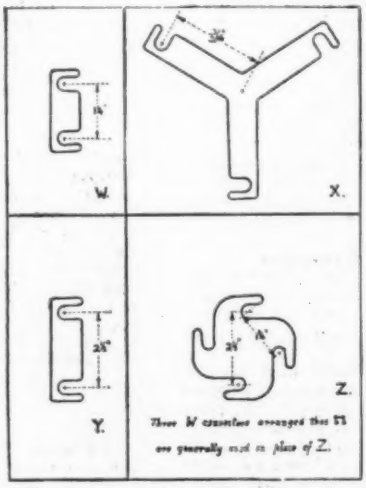


Fig. 2.—Connecting Links.

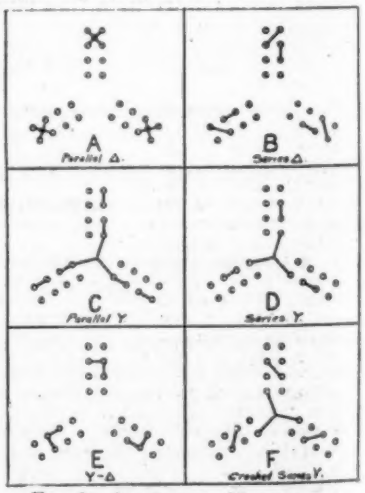


Fig. 3.—Alternative Methods of Interconnecting the Secondary.

THE ASSOCIATION OF MINING ELECTRICAL ENGINEERS.

At Birmingham, on November 15th, Mr. E. P. Hollis delivered his presidential address (of which the following is an abstract) before the Warwickshire and Staffordshire branch of the above Association:—

The main problem which is now set us, and with which this Association will be deeply concerned, is an increase in production. I do not think that any of us realise how deeply and seriously this matter affects us; there can be no doubt that if we do not increase our production to the requisite degree this country is going to sink to a very low standing amongst the peoples of the world. The application of power to the mining industry is one of the greatest instruments for increasing production in that industry, and if it be applied thoroughly and properly it will render immense service to the country. Efficiency is a most desirable attainment, but people who talk glibly about efficiency have, as a general rule, very little idea what it means. No matter where one looks one will find that everything is done inefficiently, a most inglorious record, which is not always open to the

view of the casual observer. Our railways are most inefficiently conducted. Birmingham stands without parallel in the world's large cities in that it has no electrified lines. Our Government departments are no models of efficiency. The general business training of the public is bad, and inside the factories inefficiency is rampant simply because nobody knows any better. An inefficient system reacts upon the workman and produces a listlessness and indifference to output. There is, therefore, a great need for some systematic teaching of efficiency. If the fundamental principles of economics were taught to children they would be able to appreciate their value, would learn at a time when their minds were most receptive to the information, and they would be ready to combat false doctrines intuitively when they were presented.

The only way to increase production from the mines is to put the planning of the production scheme entirely in the hands of a skilled mining engineer. Owners can do their best, but unless the scheme matures under the influence of the engineer, it is in all probability doomed to failure. I contend that it is for the engineer to make his weight felt, and to press resolutely and continuously until his counsels are fully utilised and his position properly acknowledged.

What results are obtained in those works and industrial organisations which have no special production engineers can only be realised by those conversant with the improvements which can be effected by a high-class production man. In mining work the increase of production has never been considered properly in this way; in a mine all sorts of "bottle-necks" are to be found, but they can be eliminated, and the members of this association will have to see that their experience is fully utilised in this direction.

During the last session I initiated a discussion upon the merits and demerits of electrically-driven coal cutters, and I was greatly surprised by the general consensus of opinion in their favour. The coal cutter is one of the most difficult pieces of machinery to design and run, but it was very clear from the remarks made on that occasion that the electrically-driven coal cutter was a most potent factor for increasing production, and, in fact, it is the only method of getting maximum production contingent upon the circumstances being favourable for its use. What has to be guarded against very strongly is the introduction of a few of these machines in a casual way. Maximum production can only be obtained by machine mining on an intensive scale.

There is without a doubt no industry into which the same degree of skill in electrical engineering is put as in the mining industry. The mining industry has in this association a special organisation, caring for the application of power to production. That skill is in the members' possession, and if they find that inadequate use is being made of it, then it is for them to push and see that their experience is turned to account.

From my own knowledge I am quite certain that the mining electrical engineer is not sufficiently consulted, and, therefore, does not apply himself as closely as he might to the problems of production. These facts must be brought home to those in authority. I plead most earnestly with managers and directors who are members of this Association to make the utmost use of the engineers, mechanical and electrical, who are engaged upon mining work. They are earnest and enthusiastic men, and if their energies be turned in the proper direction and duly appreciated, many of the problems met in increasing production will be rapidly and satisfactorily solved.

SUNCO ELECTRIC FIRES.

Last week we had an opportunity of viewing a new product, namely, Sunco electric fires, made and in the making at the works department of the Sun Electrical Co., Ltd. This series of fires has been designed with a view to providing reliable fires in artistic cases. The first models produced are those period designs which are adaptable without incongruity to decorations of other periods, but it is intended to place on the market other attractive designs at an early date. Owing to the war these fires have not been placed on the market before, but they have been on test for a period of four years, during which time, we understand, they have proved entirely satisfactory in all respects. The construction of the electrical elements is robust without being unduly heavy, the actual heating element being enclosed in a curved fireclay channel. The clay heats up in a very short time, and the curved front of the element diffuses radiant heat over a larger area than would be the case with a flat element, and gives a greater side heating effect. To give an idea of the quality of the fire clay it may be stated that it is possible to heat an element until it is red hot and then drop it into cold water without fear of cracking. Sunco fires begin to glow almost immediately they are switched on, and the heat radiated is surprising considering their size. The standard unit loading is 500 watts, but 600- and 750-watt loadings can be supplied if required. The heating spiral works at a temperature of about 650 deg. C., the melting temperature being 1,250 deg., so that they work well within the safe limits. The multiple-bar fires are built up of several standard units fitted to a frame, which is easily removable as a whole from the casing. The connections between the elements and the terminal are made of copper wire, a special terminal ensures that the flexible is not easily pulled away from the casing. The single-bar fires are controlled by means of a modified tumbler switch, while the mutiple-bar models are fitted with rotary switches. The makers claim that the fire radiate sufficient heat to raise the temperature of an ordinary room to a comfortable degree, and no handles are fitted for portability. In the two-bar Jacobean model shown in fig. 1, which is suitable for morning rooms or halls, the heat is focused at a convenient level, and if required dishes can be kept warm on the flat top. The weight of the fire is 17.5 lb. and the standard loading 1,000 watts, but they can be supplied for 1,200 and 1,500 watts if required. Two heat control is provided, one fire

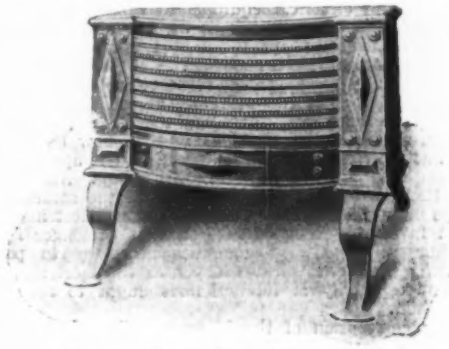


Fig. 1.—Sunco 2-bar Jacobean Fire.

bar being across the mains and the other bar controlled by a switch. The Adams four-bar model, fig. 2, is handsomely finished, being designed for reception rooms and similar interiors. The standard loading is 2,000 watts, 2,400 or 3,000 watts supplied if required, and the weight 20.5 lb. Two switches give a three-heat control, one bar being across the mains, while the switches control two and one bar respectively. The single-bar fire, which is portable inasmuch as it can be easily carried from room to room although no

Fig. 2.—Sunco 4-bar Adams Fire.

handles are fitted, is suitable for intermittent local heating. Although its weight is only 6.25 lb., weight has not been sacrificed at the expense of strength. In all models the fire case is of fine grain soft grey iron and the standard finish black eggshell lacquer, with applied copper or brass ornaments, but other finishes to harmonise with the existing scheme of decoration can be supplied if specified by the customer. The fires are supplied with a substantial wire guard in front, two yards of flexible cord and two switches complete. In conclusion, our thanks are due to Mr. E. R. Morton for facilitating the works inspection and providing the particulars set out above.

Electrical Supplies in South Africa.—The *S.A. Mining and Engineering Journal* for October 11th states:—"Tubing is getting scarcer than ever, and there is practically none in town; consignments are on the way, but it is impossible to say when they will arrive. Lamps have not increased in price yet, but the tendency is for them to harden, and unlike six or eight weeks ago, when these were sold freely in order to secure other orders, dealers are not evincing any eagerness to dispose of stocks on hand. Indeed the tendency is for all electrical materials to go up in price."

THE INSTITUTION OF ELECTRICAL ENGINEERS.

Inaugural Address of Mr. Roger T. Smith, President.

(*Continued from page* 651.)

It has been already pointed out that this analysis only indicates tendencies, and I think it may be claimed that basing the working costs of each kind of locomotive, steam and electric, on the average train-miles hauled in a year, and placing the known increase in train-miles hauled by an electric locomotive at reasonable figures for passenger and goods respectively, the passenger electric locomotive might have difficulty in earning sufficient revenue to meet all present charges and have enough to spare to pay for electricity and for interest on the electrical equipment, while the goods locomotive could much more than do so, provided in both cases electricity is bought or produced by the railway at ¼d. per KW.-hour at the generating station. I must, however, insist once more that in an analysis of this sort the actual conclusion come to, which is in the form of the weight of passanger train and of goods train (including the locomotive) that can be hauled for the same working expenses now necessary for steam traction, has no intrinsic value, and if applied to any individual case might be most misleading. All that the figures show is that in a typical case for the same working expenses now incurred by steam traction, electrification is more in favour of goods haulage than of passenger haulage, and among the railway economies necessary to pay the enormously increased working expenses the electrification of goods and especially of mineral lines ought to receive due consideration.

With the exception of the 18 route miles of mineral line already referred to between Shildon and Newport which have been electrified by the North-Eastern Railway with great success, all the electrified railways in this country are of the suburban type in that they are worked on the multiple-unit system, each unit consisting of a motor coach hauling or pushing one, two or three trailers, these units being made up into trains of any length required to suit the traffic conditions, capable of being driven from either end whatever the formation may be.

The feature of all suburban electrification replacing existing steam haulage has been first to restore a decreasing traffic, in cases where it had decreased, and then to increase the traffic. Figures for several such cases have been published, and I only propose to add some particulars given me by Sir Herbert Walker for the London and South-Western electrified suburban system. The length of route electrified is 49 miles and the length of single track is 152 miles.

LONDON AND SOUTH-WESTERN RAILWAY.

Number of passengers (including season-ticket holders) travelling on the suburban electrified system, exclusive of those travelling only between Waterloo and the City.

Year.	Haulage conditions.	Passengers.	Car mileage.
1913	Steam	25,011,569	—
1915	Steam until Oct. 25th, when Wimbledon section started	23,301,236	—
1916	Electrification nearly complete	29,361,917	12,355,404
1917	Electrification complete	32,869,316	16,089,563
1918	Electrification complete	40,376,371	15,452,352

Between 1913 and 1915 the total number of passengers carried annually by steam trains fell from 25,000,000 to 23,300,000, or 7 per cent. The first electrified section started in October, 1915, and the number of passengers carried in 1916 showed an increase of 26 per cent. over the previous year. In 1917, when the programme of electrification was complete, the number of passengers carried showed an increase of 41 per cent. over 1915, and during 1918 an increase of 73 per cent. over 1915. The passengers carried last year amounted to over 40,000,000, with a car mileage of 5 per cent. less than in the previous year. During this year so far the 1913 figures have been more than doubled.

The L. & S.W. Railway electrification has proved satisfactory not only in averting and restoring a diminishing traffic, but assisted by war conditions, has been used to its utmost capacity and proved a most valuable additional facility for the Government in meeting the restrictions placed on road motor traffic.

In Great Britain at the end of 1918 as at present there were 351 miles of railway route electrified, equivalent, with sidings, to 834 miles of single track. By the courtesy of the general managers of fourteen of the leading British railways using electricity for traction, lighting, and power, I am able to give the total amount of electricity used for such purposes by these railways during last year.

Also through the good offices of Mr. H. M. Hobart and the public-spirited energy of Mr. Oehler, one of the associate editors of the New York *Railway Age*, I am able to give similar figures for eight of the railways in the United States.

The information may be taken as fairly representative, but unlike that given for British railways it is very far from being complete. Moreover, it includes no underground railways. Six out of the eight railroads are trunk lines where the majority of the traffic is hauled by steam locomotives and about half of the 2,762 miles of single track for which figures are given is main-line electrification.

For the eight railways in question during 1918 the electricity used for traction was 478,000,000 KW.-hours, with an annual one-hour load factor of 46 per cent. Almost exactly half of this electricity was bought at an annual one-hour load factor of 49 per cent., while that generated by the railways had a load factor of 42 per cent.

For lighting and power 164,000,000 KW.-hours were generated and bought at an annual one-hour load factor of 44 per cent.

It will be noticed that in every instance the load factor is better than on British railways, being above rather than below 40 per cent.

Sixty-eight American railways possess 760 workshops, two-fifths of which generate their own electricity for power, and a total of 366,500 H.P. is connected to the supply.

On the 14 British railways, which possess all the electric traction and by far the greater part of the use of electricity for other purposes in this country, the total KW.-hours used during 1918 for traction were 400,000,000 and the kilowatts of maximum demand averaged over an hour were 123,000. Consequently the annual one-hour load factor was 37 per cent. Ninety per cent. of the electricity was generated by the railways at an annual one-hour load factor of 41 per cent. The remaining 10 per cent. of the electricity was bought, and from the figures of maximum demand given, which are generally difficult to estimate, the load factor is 19 per cent.

The important point is that for suburban services, many of them continuous for 20 hours or more, the greatest annual load factor which has been obtained in this country when railways generate their own electric power is about 40 per cent. It is probable that the electricity bought had about the same load factor.

The load factor for the electricity used for lighting and power is referred to later in its proper place. The total use of electricity by the 14 railways for traction, lighting, and power in 1918 amounted to 517,000,000 KW.-hours, and the annual one-hour load factor was 34 per cent.

When the war started, British railways were actually committed to the carrying out of additional electric traction, and with it a certain amount of power and lighting which was stopped by the war. Had this work been carried out the estimated KW.-hours of electricity generated would have been 357,000,000 at an estimated load factor of 43 per cent.

But for the war the total electricity generated and bought by the 14 railways during 1918, including these commitments, would have been 875,000,000 KW.-hours at an annual one-hour load factor of 37 per cent.

For 1918 no complete returns of the electricity sold by public supply authorities in the United Kingdom are available. In 1914 it was 2,100,000,000 KW.-hours and in 1917 3,520,000,000 KW-hours. It has been estimated at 4,200,000,000 KW.-hours in 1918, it being of course understood that this figure is only for supply authorities, and is exclusive of the quantities privately generated.

The 14 railways, therefore, actually used for all purposes in 1918 12¼ per cent. of the quantity generated by supply authorities, and would have used 20 per cent. taking account of such part of it as would have been bought, supposing their actual commitments had not been stopped by the war.

Apart from the importance of the present railway load, as compared with the whole load of the supply authorities, a proportion which is quite certain to increase as soon as railway policy is defined, I have insisted on quoting a number of figures including load factors because there has been a tendency in some quarters to exaggerate the value of the railway load factor, which it will be seen both in actual fact and in estimate is in this country below 40 per cent. for the densest type of suburban service. The highest railway traction annual one-hour load factor in this country for one of the most dense electric services in the world—the London tube service—reaches 48 per cent., and is the same for traction as for lighting and power. But this value is altogether exceptional.

USE OF ELECTRICITY BY 14 LEADING BRITISH RAILWAYS FOR TRACTION, LIGHTING, AND POWER DURING 1918.

Traction on 10 *Railways.*

Length of electrically-equipped route, miles	351
Equivalent length (including sidings) of single track, miles	834
Electricity generated by railways, KW.-hours	360,171,100
Maximum demand averaged over one hour (one-hour demand), KW.D.	99,380
Annual one-hour load factor, per cent.	41.5
Electricity bought by railways, KW.-hours	39,076,000
Maximum one-hour demand, KW.D.	23,450
Annual one-hour load factor, per cent.	19
Total use of electricity for traction by 10 railways, KW.-hours	399,247,100
Maximum one-hour demand, KW.D.	122,830
Annual one-hour load factor, per cent.	37

Lighting and Power on 14 Railways.

Electricity generated by railways, KW.-hours ...	83,760,900
Maximum one-hour demand, KW.D.	30,300
Annual one-hour load factor, per cent.	32
Electricity bought by railways, KW.-hours	33,893,130
Maximum one-hour demand, KW.D.	21,530
Annual one-hour load factor, per cent.	18
Total use of electricity for lighting and power, KW.-hours	117,654,030
Maximum one-hour demand, KW.D.	51,730
Annual one-hour load factor, per cent.	26

Total Use of Electricity on 14 Railways for Traction, Lighting and Power.

Electricity generated and bought, KW.-hours ...	516,901,130
Maximum one-hour demand, KW.D.	174,560
Annual one-hour load factor, per cent.	34

Additional Commitments for Traction, Lighting and Power to have been carried out but for the War.

Electricity generated and bought by eight railways, KW.-hours	357,564,980
Maximum one-hour demand, KW.D.	95,190
Annual one-hour load factor, per cent.	43

Total Use of Electricity on 14 Railways for Traction, Lighting and Power inclusive of Actual Commitments to have been carried out but for the War.

Electricity generated and bought by 14 railways, KW.-hours	874,466,110
Maximum one-hour demand, KW.D.	269,750
Annual one-hour load factor, per cent.	37

Seven Railways with Electric Traction in Greater London.

Length of electricity equipped route, miles ...	211
Equivalent length (including sidings) of single track, miles	556
Electricity generated and bought for traction, KW.-hours	340,247,160
Maximum one-hour demand, KW.D.	100,340
Annual one-hour load factor, per cent.	38.5
Electricity generated and bought for lighting and power, KW.-hours	52,459,780
Maximum one-hour demand, KW.D.	20,720
Annual one-hour load factor, per cent.	29
Total use of electricity for traction, lighting and power, KW.-hours	392,706,940
Maximum one-hour demand, KW.D.	121,060
Annual one-hour load factor, per cent.	37

Additional Commitments for Traction, Lighting and Power to have been carried out but for the War.

Electricity generated and bought by seven railways, KW.-hours	247,564,980
Maximum one-hour demand, KW.D.	75,190
Annual one-hour load factor, per cent.	37.5

Total Use of Electricity by 14 British Railways for Traction, Lighting and Power, including Actual Commitments to have been carried out but for the War.

Electricity generated and bought by 14 railways, KW.-hours	874,466,110
Maximum one-hour demand, KW.D.	269,750
Annual one-hour load factor, per cent.	37

USE OF ELECTRICITY FOR EIGHT RAILROADS IN THE UNITED STATES FOR TRACTION, LIGHTING AND POWER DURING 1918.

Traction for six Railroads. Four of them Steam Trunk Lines with some Electric Traction.

Length of electrically equipped route, miles ...	1,413
Equivalent length of single track, miles ...	2,762
Electricity generated by railroads, KW.-hours ...	237,732,125
Maximum one-hour demand, KW.D.	63,630
Annual one-hour load factor, per cent.	42
Electricity bought by railroads, KW.-hours ...	239,847,678
Maximum one-hour demand, KW.D.	55,150
Annual one-hour load factor, per cent.	49
Total use of electricity for traction by six railroads KW.-hours	477,579,803
Maximum one-hour demand, KW.D.	118,780
Annual one-hour load factor, per cent.	46

Lighting and Power on Eight Railroads.

Electricity generated by railroads, KW.-hours ...	105,763,924
Maximum one-hour demand, KW.D.	28,650
Annual one-hour load factor, per cent.	42
Electricity bought by railroads, KW.-hours ...	58,024,000
Maximum one-hour demand, KW.-hours	14,445
Annual one-hour load factor, per cent.	46
Total use of electricity for lighting and power, KW.-hours	163,787,924
Maximum one-hour demand, KW.D.	48,005
Annual one-hour load factor, per cent.	44

Total Use of Electricity on Eight Railroads for Traction, Lighting and Power.

Electricity generated and bought, KW.-hours ...	641,367,727
Maximum one-hour demand, KW.D.	161,785
Annual one-hour load factor, per cent.	45

Diversity of many loads, of fairly good but different load factors, from one or more interconnected power stations where the individual units can be of greater output than would be possible in a power station devoted almost entirely to traction, will do more to cheapen electricity than the separate generating station for each railway. In London this result could have been achieved in the past by supplying the electrical needs of several railways from one station, but railway legislation made this quite impossible. So far as cheap electricity is concerned it would be an advantage for railways to be able to obtain electricity from power stations with diversity of load, generated by units of power large enough to reduce the capital invested to the lowest possible figure, since capital costs are half the generating costs and large turbo-generators are more economical than small ones.

(To be concluded.)

REVIEWS.

Regulations for the Electrical Equipment of Ships. London: Institution of Electrical Engineers, or E. & F. N. Spon, Ltd. Price 2s. 8d., post free.

THE long-expected "Regulations for the Electrical Equipment of Ships," have now been issued by the Institution of Electrical Engineers in the form of a trig little pocket book of 86 pages.

The committee, which was composed of representatives drawn partly from the Institution of Electrical Engineers and other interested bodies, has done its work well, under the appropriate chairmanship of Mr. C. H. Wordingham, C.B.E.

The main object kept in view was to compile rules to ensure satisfactory results and uniform practice. All the available and applicable British and foreign regulations have been examined and sifted and the best retained. The vital requirements for successful electrical installation have been made as definite and mandatory as possible. The small editing sub-committee of four is to be specially congratulated on the tone of distinction and clarity in which the rules are stated. The regulations apply to the generation, storage, and distribution of electrical energy for all ship purposes other than the actual propulsion of sea-going vessels, and they do not apply to ships of war. They are not to be taken to exclude new systems or arrangements if these are effective and safe.

At the beginning is a set of definitions, and it will be noticed that for the most part these agree in sense, if in some cases not in diction, with the definitions of the I.E.E. Wiring Rules, and they do not suffer by comparison. One notes, however, that in the definition of a "fitting" it is made to include not only the brackets and pendants, but also the switches, fuses, plugs, and other accessory appliances. This is a considerable stretching of the trade term "fittings," which has, of course, hitherto been restricted to the supports for lamps.

It is a new departure in electrical regulations to insert quasi specifications of steam and internal-combustion engines. But these are included for the useful purpose of stating the most suitable pressures and speeds for marine direct-coupled sets, and also to limit, if possible, the number of differing sizes of each type. The list of standard internal-combustion engines might usefully be extended to much larger sizes which are now available.

The requirements regarding generators, although not exhaustive, are excellent, and worthy of widespread application.

The same remark might be made about the paragraphs dealing with switchboards. Where circuit-breakers are fitted, the design must be such that they are not thrown off by vibration or sudden shock to the vessel. This is not always attended to, and might have been worth mention.

Where practicable, switchboard instruments are best placed with the plane of their faces fore and aft, because with many instruments the rolling of the ship affects the reading. This recommendation also might be worth inserting in future editions.

For two-wire D.C. systems no opinion is expressed as to which of the wires ought to be earthed, though there is something to be said for reversing the common practice in this respect.

The provision that conductor fall of pressure on maximum load shall not exceed 2 volts plus 3 per cent. of the busbar pressure for lighting is a distinct improvement upon the corresponding I.E.E. Wiring Rule, which limits the fall to 2 volts plus a constant allowance of 1 volt. Presumably the standard voltages given are those of the lamps.

The section dealing with the insulation and protection of cables treats of V.I.R. and paper-covered cables, and one notes that bitumen and tough rubber protection are not specifically mentioned here, although for flexible cords the latter form of protection is among those permitted.

Naturally the regulations deal very fully with lead coverings for cables. Such coverings are to consist of pure lead. This rules out systems the sheathing of which consists of antimonious lead or other alloys. A table of maximum spacing for clips is provided. The distance between these is less than has been the general practice. Conditions under which conduits may be used are stated: whether or not such conduit should be galvanised is left to the judgment of the installer.

A useful suggestion is made to provide a suitable connection box to enable a vessel to be supplied from a dock or from another ship installation.

E

Experience relative to the effect of electrical apparatus on compasses has dictated a number of special regulations on this point. In this section it might be an advantage to specify that compass lamps should not have spiral filaments.

The paragraphs dealing with batteries, fittings, and accessories are definite and clear, and, as far as applicable, British engineering standard specification designs are recommended.

Several pages are devoted to motors and their control gear and to other accessory apparatus. As far as possible, everything connected with these is arranged for easy identification, expeditious fault-testing, and quick repair.

Lightning conductors are dealt with, and two special rules apply directly to the dangers peculiar to oil ships.

The book concludes with a set of tests for insulation. These differ somewhat from the I.E.E. Wiring Rules tests, as naturally the more severe conditions result in a lower degree of surface insulation.

There is a very complete index, and several pages of squared paper for notes are provided.

Taken generally, the new regulations are unique in their comprehensiveness, and the wiring section in particular is perhaps the best set of rules yet issued. D. S. M.

THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.

List of Contributions in connection with the Annual Festival Dinner, 1919. (Incomplete.)

CHAIRMAN'S PRELIMINARY LIST.

	£	s.	d.
Cash, H. J., & Co., Ltd.	50	0	0
Cash, H. J.	10	0	0
Salomons, Sir David, Bart.	5	5	0
Barwell, James, Ltd.	1	1	0
Incledon, H., & Co., Ltd.	2	2	0
King, P. T.	2	0	0
Keeble, Ltd.	1	1	0
Foot & Milne	2	2	0
Wilson, W. D.	1	1	0
Maxwell, Butcher & Co.	1	1	0
Heatley & Gresham Engineering Co.	1	1	0
Metal & Hardware Products	1	1	0
Dixon, S., & Sons, Ltd.	1	1	0
Watson & Sons (Electro-Medical), Ltd.	1	1	0
Middleton, E. S.	0	10	0
Brice, W. V.	0	10	0
Falconar, Cross & Co.	3	3	0
Taylor, George E.	25	0	0
Dodimead, J., & Son	2	2	0
Hawkins, F. J.	3	3	0
Drake & Gorham	3	3	0
Eck, Justus	1	1	0
Sutton, G.	1	1	0
Baker, Chas. A.	1	0	0
Preston, G. A.	0	10	0
Baxter, W. A.	5	0	0
Hellyar, S., & Co.	1	1	0
Tyler & Freeman	5	5	0
Garcke, E.	5	5	0
Sutton, G.	10	0	0
Madgen, W. L.	3	3	0
Toy & Winslow	2	2	0
Connal, A. R.	1	1	0
Electric Installations, Ltd.	4	4	0
Goad, W.	5	5	0
Marryat, H.	10	10	0
Gill, E. C.	0	10	0
Kemp, L.	0	10	0
Baxter, D.	0	10	0
Mayo, H. J.	0	10	0
Cant, J. G.	0	10	0
Willmer, H. H.	0	10	0
Cramer, F. A.	0	10	0
Brokenridge, D. W.	0	10	0
Lawton, E. W.	0	10	0
Bristoll, T.	0	10	0
Gladding, E. T.	0	10	0
Knight, C. I. V.	0	10	0
Electrical Contractors' Association	50	0	0
Mann, Egerton & Co.	25	0	0
Leaf, H. M.	1	0	0
Banks, T. H.	1	0	0
Middleton, V. G., & Co.	5	5	0
Marshall, F. W.	2	2	0
Coleby & Co.	1	1	0
Turner, G. H., & Co.	1	1	0
Polden, F., & Co.	1	1	0
Edey, D.	2	2	0
Edwards, E. E.	2	2	0
Girdleston & Co.	10	10	0
Radford, E. R. (Messrs. Trollope & Colls)	3	3	0
Electrical Contractors' & Maintenance Co.	3	3	0
Anderson, P. & W.	3	3	0
Malcolm & Allan	5	5	0
Ludgate, T.	2	2	0
Russell, J. W.	1	1	0
Arnold, Herbert	2	2	0
Napier, T. Disney	0	10	6
Wood, Alfred	2	2	0
Hobbs, W. E.	2	2	0
Ellis, T. W.	1	1	0
MacDonall, Syer & Co.	4	4	0
Pottle, G.	0	10	6
Barwell, H.	0	10	6
Seamen, A. G.	1	0	0
Hodgson, T., & Co., Ltd.	2	2	0
Walton, W. H.	10	10	0
	£326	11	6

H. BEVIS'S PRELIMINARY COLLECTION.

	£	s.	d.
Gorton & Halliday	2	2	0
Langley, Smith & Co.	2	2	0
Alfred Stern & Co.	1	1	0
Hearl, Heaton & Sons, Ltd.	5	5	0
Wood & Fairweather	3	3	0
Stott Bros.	10	10	0
Cawson, G., & Co.	1	1	0
Anderson & Robertson	2	2	0
Heilbert, Symons & Co.	10	0	0
Alden's Successors, Ltd.	2	2	0
Symington & Co.	2	2	0
Smith, Frederick, & Co.	2	2	0
Wilcox, W. H., & Co.	3	3	0
Lancashire Wire Co.	2	2	0
Wilkes, John, Sons & Mapplebeck	5	5	0
Driver & Co.	1	1	0
Jerrard & Co.	1	1	0
Waltham Cross Joinery	2	2	0
Walker, James, & Co.	1	1	0
Espir, Fernand	2	2	0
	£61	9	0

Further contributions to the Chairman's list and Mr. Bevis's collection, together with Mr. Hunter's and Mr. Fletcher's collections, will appear in a later issue.

Individual Electrical Drive in Textile Factories.—An interesting article dealing with the "Oerlikon" new electrical individual drive for ring spinning and twisting frames appeared in the *Textile Recorder* for October, and is concluded in this month's issue. The article is well illustrated, and gives a description of the machinery which has been designed to suit the special speed requirements; to increase the production by about 10 to 15 per cent.; to simplify maintenance and costs; and to adapt itself to small space requirements. It is claimed by the makers that a smooth jerkless starting-up of frames is possible with a starting current of 1·7 times the normal, the motive power being provided by a three-phase squirrel-cage induction motor, and transmitted through the patented individual drive. There also appears, in the same issue, a short fully-illustrated article dealing with the G.E.C. "Witton" motors for driving French drawing and worsted mule spinning machinery.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Electricity Supply Bill.

My attention has been drawn to the following paragraph which appeared in Mr. Arthur Ellis's address as chairman of the Western Centre of the Institution of Electrical Engineers:—

"This brings me to the introduction of the Electricity (Supply) Bill in Parliament by the Government. A paper was read before the Institution by Mr. E. T. Williams in 1916, and knowing what we do to-day, one is almost inclined to think that his paper was inspired by the Government itself, as, if not, then it represents a very wonderful anticipation, to a very great extent, of what the Government actually intends should be done, and if the latter is a correct assumption, then Mr. Williams has undoubtedly done a great and lasting service to the country."

While noting Mr. Ellis's courteous remarks, I think it is incumbent upon me to state that my paper on this subject was in no way inspired by the Government, and, in fact, had no relationship whatever to my official position. Before entering the Government service I had several years' experience in the electricity supply industry of this country, and the original paper, which was much more extensive than that printed in the *Proceedings* of the Institution of Electrical Engineers, was written on board a P. and O. steamship in March and April, 1915, during my return journey to England after six years' absence in the Far East. It is very gratifying to me that this Bill is likely to be passed.

Ernest T. Williams.

London, *November 18th*, 1919.

The New Standards for Cables.

My attention has been called to the letter signed by Mr. Geo. J. Smith, in your issue No. 587, under the above heading.

A considerable amount of the letter is taken up with matters of opinion, on which I will not enter into any discussion, but there are one or two points of principle at issue, on which I should be sorry that the industry generally should be misled by any statements or suggestions in Mr. Smith's letter.

It is stated that the new list appears to have been expressly designed to cause confusion, the point at issue being the use of "areas" of wire instead of the old standard wire gauge. On this point I should like to make it clear that neither the Cable-Makers' Association nor the British Engineering Standards Association was the prime mover in the substitution of an area table for the wire gauge. The matter was pressed forward by manufacturers using wires, by electrical contractors and by Government departments, and the Institution of Electrical Engineers' Committee dealing with the Ship Wiring Equipment Rules were unanimous in their desire to substitute definite measurements understood all over the world, for a national wire gauge of a very limited currency.

The next question at issue is the substitution of 1,000 yards as the unit, instead of a mile of 1,760 yards. It is suggested that this is a covert attempt to introduce the metric system. I can assure your readers that no such object was in view, but it may be admitted that it is a concession to users in other countries than those accustomed to working with the mile, to use a system of arithmetic with which they are conversant, and more congratulations have been received by this Association on this point than on any other point arising on the new standards.

The question of "flexibles" is one which has in the past been a cause of much difference of opinion, and it may be that it will so continue, but the fact remains that the immense variety of flexible strandings that have been current without arriving at any definite decision that one is better than another, and the experience during the war that users found satisfaction with a very limited range of sizes, convinced the cable manufacturers that the time had come to limit the use of an indefinite number of strandings of flexibles.

The suggestion that it is an advantage to the cable-maker to have only a limited number of sizes of dies for drawing is founded on a misapprehension. The wear of dies is so rapid that, from the point of view of dies alone, the greater the number of sizes of wires, the less is the cost of keeping dies re-sized. The advantage to the cable maker lies in having to stock only a limited number of sizes of wire with which to execute all his orders, and the advantage to the consumer lies in the more rapid completion of orders, as stocks will be more likely to be held of all the standard sizes, with the further advantage that there is a reduced cost of production.

The question of change of price has nothing whatever to do with the standards. The prices of standard sizes which were current up to the time the change was made were known by every user to be lower than the market price of materials or the present rates of wages justified, and prices would undoubtedly have been advanced earlier had not the new list with the new sizes been in preparation.

The statement that the prices are advanced 40 per cent. is not, except in isolated cases, true, though the advance in materials and in wages since the last lists were put in force would have justified an advance of that amount.

With regard to wires for instrument work, no doubt at present these may be worked to the old wire gauges, though to a very large extent these have for years been specified on diameters, and not on wire gauges.

With regard to the suggestion made in the last paragraph, that buyers should mark their orders in a way that refuses to accept the new sizes or 100-yard coils, I should be sorry to think that any considerable number of members of the trade would endeavour to obstruct by such methods a change which has the support of a great majority of the industry, and there can be no question that manufacturers would be obliged to make extra charges for departures from standard manufacture, if so ordered.

With regard to the letter of "Contractor" in your issue of November 21st, I will not enter upon the matter raised in the first three paragraphs as they are trade matters, which members of the C.M.A. will readily discuss with their customers, but are apart from the question of standards, but I will reply to the two questions addressed to the C.M.A.

1. The I.E.E. have agreed the new standard sizes, and no doubt the Wiring Rules Committee will amend their rules to agree therewith. The I.E.E. Ship Electrical Equipment Committee have substituted the ·0015 sq. in. for the 1/18 S.W.G. as the minimum size of conductor to be used.

2. The "average wireman" has previously had to select a coil of 3/·036 (S.W.G. 3/20) from 3/·028 (S.W.G. 3/22); he will probably find that it is not more difficult to distinguish between 3/·036 and 3/·029.

It is perfectly true that every change means some trouble to all concerned in the first instance, but a short time will remove the trouble, and then if the change (as in this case) is one that the industry has in advance decided is a real improvement, the industry will benefit in a way that is quite out of proportion to the trouble which the first few weeks of change throw upon it.

The Cable-Makers' Association,
LLEWELYN B. ATKINSON, *Secretary.*

London, *November 19th*, 1919.

I am delighted to see "S. E. G.'s" letter in answer to mine in your columns this week. It is evident that he does not agree with me, but so far from showing where I am wrong, he really emphasises my chief point, for he says: "The S.W.G. is, after all, only an actual diameter with another name." Exactly; and for what reason, other than confusion, is a name that everyone is used to, changed? Had "S. E. G." said, "under a more convenient name," he would be more accurate, for a simple definite number is certainly easier to memorise than a string of decimals. Your correspondent seems to have misunderstood me in one place, and misread me in another. My remarks in connection with the micrometer were not intended for an injustice at all, but merely a question as to whether a tool so treated could be read by anyone. Of course, a workman who wilfully misuses a fine measuring instrument is generally unreliable in reading its indications.

If "S. E. G." will again read my original letter, he will see that what I said was "one *firm* would quote for and specify, &c." I should regard a customer who could draw up his own specification as the reverse of non-technical, and should at once assume that he would recognise the difference in diameter, but even then not its electrical significance, as I am frequently asked to explain why a low voltage needs a thicker, and not a thinner, cable than a higher voltage. I am quite prepared to admit that I am not up-to-date as defined by some, but one thing I have learnt is that time is the most precious item, and I have found life far too short to adopt any government methods. I think that at this juncture we all have enough troubles, without having any extra that this horrible muddle will entail, and I sincerely hope that it will be strangled in its infancy.

East Lancashire Electric Co.
GEO. J. SMITH, *Engineer and Manager.*

Accrington, *November 17th*, 1919.

I have not yet seen any table giving comparisons between the cost of the old sizes of cables generally in use by wiring contractors, and the cost of the new equivalent sizes, and I am sure the following will be of interest to many:—

Comparison of Costs of Cable, Old and New Sizes.—The old sizes given are in common use by contractors, and will be recognised by the trade; the new sizes are those which would have to be used to carry the same load.

Prices taken from both old and new lists, both issued in 1919, by same maker.

Old sizes. Price in shillings per 100 yd.	New sizes Price in shillings per 100 yd.
15·5	23·3
25·4	28
28	34·6
38·4	45·2
64·5	74·6
95·5	99·2
131	161·2
214	220
260	241
374	398
602	620

It would appear that "A rose by any other name" costs more, and in view of the fact that the reduction in number of sizes available should cheapen the cost of production, the increases in prices shown seem to be a distinct contravention of the Profiteering Act, or at any rate of the spirit of the Act.

I would suggest that the C.M.A. dismiss from their trade mark the kilted Roman, with the sporran on his hat, and substitute a three-phase pawnbroker's sign upheld by a rampant son of Israel.

Eboracum.

November 24th, 1919.

I have been interested to note the comments in your "Correspondence" column relative to the introduction of the new standards for cables. The gentleman signing himself "Contractor," in your issue of the 21st inst., draws attention to a very real and serious problem likely to face every electrical contractor.

Whilst the average wireman is not likely to be called upon to actually issue cable from stock, he certainly will have to deal with the cable when on his job, and it seems to me that a good deal of confusion will arise when dealing with cables such as those mentioned—say a partially used coil of 3/·036 and 3/·029. If some system of distinguishing cables other than by the use of the micrometer could be embodied in the manufacture of the cables, matters would be very considerably simplified.

The suggestion I have to make is that, perhaps, it would be found possible to use differently coloured tapes under the braiding of V.I.R. cables. For instance, 3/·029 might have a red-coloured tape, whereas 3/·036 might be black-taped. Such a system need only apply, perhaps, to the smaller sizes of cables, thus necessitating, say, two colours for the 1s. sizes, two colours for the 3s., and five colours for the 7s. This would simplify both the issue and the checking of cables during the course of erection.

J. R. Halliwell.

Manchester, *November 24th*, 1919.

The Value of the London External Degree.

One cannot let pass, without comment, the adverse criticism of the London external degree by the writer of the article in last week's REVIEW. If there should be an engineer with the University stamp, surely it is he who has the pertinacity and intelligence to pass the severe tests imposed for the external degree, for not only has he had to study hard, but he has carried on the practice of his calling at the same time. It is in accord with the spirit of the age that the door to academic distinction should not be closed to those who have not the means or opportunity to pass through it in the orthodox manner. It would be as well to point out, however, that the *money* value of a degree to a student who has to fight his own way to success in the engineering industry, is practically nil at the present time; this in spite of much lip service to the contrary. Of course, to some people, knowledge of itself is a pearl of great price; the names of many such are "writ large" in history. That is their reward.

T. H.

Speeding-up of an Induction Motor.

I was very interested in "Puzzled's" letter in your columns this week, as it reminds me of a similar case that came under my notice. In this instance the supply was 200 volts, two-phase, 50 periods, with one pole of each phase earthed. The motor was of the ordinary slip-ring induction type with eight pairs of poles per phase. The motor had been taken down for repairs, and in re-assembling, the stator windings of both phases were damaged. They eventually went to earth, which had the effect of cutting out a pair of poles in each phase and caused the motor to accelerate. "Puzzled" does not say if the original speed was the one that the motor was designed to run at, nor does he state the number of phases. Such a fault as described above would not necessarily blow a fuse or trip a breaker, for both are set liberally as a rule to allow for the excess current when starting against load. I hope the foregoing will be at least of some interest to "Puzzled," and I should like to hear what the cause of the trouble eventually proves to be.

Geo. J. Smith.
Engineer and Manager.
The E.L.E. Co.

Accrington, *November 17th*, 1919.

Coal Profits and the Government.

As one who has had commercial interest in coal matters in the past, may I crave space for a few remarks upon the subject of the expressed intention of the Government to introduce a Bill to limit for the current year the profits in the coal trade to 1s. 2d. per ton?

Against this contemplated limitation it is difficult to speak too strongly, for such an interference with the liberties of private enterprise is full of menace to all British industries, and will constitute a most dangerous precedent. If once enforced in respect of the coal industry, no British industry will be secure from similar Government inroads.

This proposed interference with coal trade profits is not only unjust in principle, but is also of no advantage whatever to those most concerned—the general public—with respect either to increasing the output of coal or to lowering the price. The injustice lies in the fact that the Government proposes to apply the proposed limitation of profits to only one industry—the coal trade. Why this particular industry should be singled out for this mischievous handicapping is best known to those who have advised the Government to take the step.

As regards benefiting the public, no support for the proposed restriction of profits can be found in that direction. The effect will be quite the reverse. A limitation of profits can only mean

the plunging of a number of colliery concerns into financial trouble, which will lead to embarrassed working, and, doubtless, in some cases, to actual closure.

The Government seems to forget, too, that the coal industry is a "wasting" industry, and by its nature a somewhat speculative one. It is essentially an industry in which reserves of capital are particularly necessary, to provide against contingencies. Coal seams can be worked out, faults can appear, involving possibly great loss; floodings, explosions, and other disasters are not unknown, and to these labour troubles may be added. Why, in the face of all these factors, the Government should plunge so essential an industry—the acknowledged "key of key" industries—into further difficulties, is a subject of astonishment to most people. One has to turn back to Stuart days—the days of "benevolences" and forced loans—to find a precedent for this latest proposed Government "snatch" at private earnings.

Collieries in this country are largely owned by shareholders, scattered throughout the length and breadth of the land, and drawn from all classes, from the highest to the humblest thrifty small-holder. These are the people who will suffer from this inroad on the coal industry, and if this is permitted in respect of that industry, all other industries—the iron trade, shipbuilding, shipping, textile industries, and even trade papers—may be similarly harassed in the future.

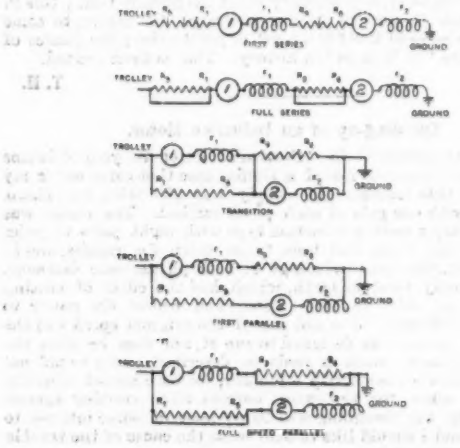
It behoves, therefore, all interested in the industrial welfare of the country to unite in protesting against this ill-advised intention of the Government.

W. H. Harvey.

London, S.W. 11, *November 15th*, 1919.

Stopping Runaway Tramcars.

My letter *re* "Stopping Runaway Tramcars" in your issue of 31st ult. has been criticised by two correspondents in your columns. The first you amply satisfied by explaining that the brakes must be released before adopting the method I mentioned, and I apologise for not having done so in my original letter. Mr. J. R. Fletcher, in the current issue, states that it is immaterial which "parallel" notch is used when operating one motor reversed and driven from the other running as a generator impelled by the car's momentum. I will agree that for some control arrangements, it will not matter which notch is used, but if the attached sketch be glanced at, one will readily see that each notch cuts out resistance between the machines.



Steps in the "Bridging Transition Method" of series-parallel control. 1 and 2 are the armatures; r_1, r_2 are the corresponding series fields; s_1—s_4, s_5—s_8, sets of grid resistances.

The sketch represents the method of series-parallel control known as "The Bridging Transition Method," and gives a remarkably smooth acceleration (actual) during the transition stage. The motors and resistances are arranged after the Wheatstone bridge scheme, each resistance "arm" having the same potential drop as the motor "arm" corresponding to it. *Re* Mr. Fletcher's remarks about stone houses for stopping cars, I think there is nothing to say.

W. G. Stuart.

Trethomas, Bedwas (Mon.),
November 18th, 1919.

Coil Ignition v. Magneto Ignition.

I am very pleased that "C.G.M., A.M.I.E.E." criticised my article on the above subject, for two reasons. First, it gives me pleasure to know that he thinks there is a future for coil ignition; and, secondly, it gives me an opportunity to prove that his statements concerning the inefficiency of the Remy are incorrect. This is probably due to the fact that he has not had an opportunity of studying the subject, or, at least, not the same opportunity that I have had.

It is true that the engine on which the Remy was fitted is a 6-cylinder vertical. The engine is the "Puma," and was manufactured by the Siddeley Deasy Motor Car Co., at Coventry. I had the pleasure of being a member of the staff of this company, and I am not wandering from the truth when I say that I have seen thousands of these engines made and tested.

Every engine was manufactured and tested under the supervision of the Aeronautical Inspection Department, and one of the tests was to run the engine at a very low speed, and alternately short-circuit the magneto and the Remy. I always found that the engine behaved better when operating with the Remy.

My position with the Siddeley-Deasy Motor-Car Co. was that of technical instructor. That is, I had charge of the technical school which was opened and conducted for the instruction of officers, technical sergeant-majors, and others, who the Air Ministry thought should undergo a course of training in the design and construction of this engine. I numbered among my pupils many well-known officers from the flight squadrons, not only in England, but in France and Mesopotamia. Thus, it will be seen that I had an opportunity of discussing the merits of both the magneto and the Remy with those who had actual flying experience with them.

One thing I did notice was that the majority of officers were under the impression that the Remy was only fitted for starting purposes. I very soon told them that the Remy was for constant running. This may account for some of the failures referred to by "C.G.M., A.M.I.E.E.," because if the Remy ran for any length of time without firing, the points of the plugs connected to it would become sooted up; then, if it was required for use, no spark would be available, due to the sooty short circuit. Referring to the Liberty, I do not think that much ignition trouble was experienced during the flight from America to the Azores.

Cyril Sylvester, A.M.I.E.E., A.M.I.Mech.E.

Coventry, *November 18th*, 1919.

The Wife as a Commercial Asset.

If "Ann Assette's" picture of the vicissitudes of the central-station engineer and his wife is drawn from life, one can only think that over the entrance to each of the less-important stations should be inscribed the words said to have been written over the entrance to "another place"—"All hope abandon, ye who enter here." Perhaps some other "asset" will relieve our gloom by showing us the silver lining to this very dark cloud. In my opinion, Mr. Hiscox's article presents the man's point of view more fairly, although I must confess that his title does not appeal to me. It reminds one unpleasantly of the tenth commandment, where, in the list of our neighbour's belongings that may not be coveted, the wife comes second, being, in fact, sandwiched in between the house and the man-servant. As Mr. Hiscox says, "Husband and wife must be comrades," and I do not see how this can be if the wife is regarded merely as a "commercial asset."

I think, too, that he lays a little too much stress on the wife's reluctance to leave her people, for, as "Ann Assette" points out, there are many other considerations that make the woman hesitate to take the plunge that seem so desirable to the man. She often knows, to her cost, that while a proposed rise in position may look very advantageous on paper, it does not necessarily follow that it will bring increased happiness or even increased prosperity to herself, her husband, or her children. She also knows that a rise in position means a rise in the standard of living, and that it is worth while to consider whether the proposed increase of salary will cover this extra cost of living and keeping up appearances, to say nothing of all the inevitable expenses attendant upon starting a new home.

Incidentally, may I point out that "the beautiful words of our text" were addressed, not to Ruth's husband, she being a widow at the moment, but to her mother-in-law. I am afraid that husbands, both Eastern and Western, are a little bit inclined to take all that kind of thing for granted.

An Engineer's Wife.

November 18th, 1919.

Appointments in India.

I agree with what Mr. W. T. I. Turner says in his letter published in your issue of September 26th, except that he places the cost of board and lodging for a single man in Bombay or Calcutta far too low at Rs. 150 per month. Under present conditions he could, perhaps, exist on that amount, but to live in any comfort would cost him at least Rs. 200 per month. This is, of course, quite apart from the cost of clothing, conveyances, amusements, &c. A youth should not come to India on less than Rs. 450 per month, or a young married couple under Rs. 900 a month. I speak, of course, of "middle-class" people, accustomed to live in some comfort. The rupee is now worth 2s. for Exchange purposes, but in purchasing value here it is worth less than half this amount.

T.

Calcutta, *October 26th*, 1919.

Apprentices and Trade-Union Restrictions.

With reference to the modern trend of things, and your various articles on Specialisation and Trade-Union Restrictions and Lines of Demarcation, I should be pleased to see your readers' opinions on the following, if you consider it of sufficient importance to warrant you in inserting it in your "Correspondence" columns.

How is the apprentice in a power station to be trained to enable him some day to take entire charge of a generating station where he requires a knowledge of steam-raising plant and auxiliaries, steam engines and turbines, gas and oil engines, A.C. and D.C. generators, and motors, switchgear, wiring, fitting, and turning,

&c.; in short, a training to enable him to qualify for the position of chief (electrical) engineer for one of the large power plants in industrial concerns up and down the country?

What I have in mind is the difficulty which nowadays presents itself if an apprentice does a bit of mechanical work such as turning, boring, or fitting, and then attempts to do electrical work; he is told he must be either an engineer or an electrician, but not both.

I am at present in this difficulty, and before making inquiries in other directions, I should like to have your readers' views.

Engineer Electrician.

[We have received a letter from "Rewind," and would draw the writer's attention to the note at the head of "Correspondence."—Eds. Elec. Rev.].

LEGAL.

Farrant v. County of London Electric Supply Co., Ltd.

In the City of London Court on Monday, before Sir John Paget, K.C., Deputy Judge, Mrs. Elizabeth Farrant, widow, of Putney, claimed under the Workmen's Compensation Act against defendants damages for the death of her husband. Mr. Duckworth appeared for the plaintiff, at the instance of her husband's trade union, and Mr. Scallan, M.P., for the defendants. Mr. Duckworth said that the deceased's wages were £4 per week, and he had been employed by the respondents for 17 years as a cable jointer. The employers had a sub-station at Mitcham Lane, Streatham. It was the intention of the company to put in a new transformer, and a new length of cable had to be supplied passing from the transformer to the switch pillar. Plaintiff's duties took him originally to Wandsworth when he was to go to Streatham. He had to get his tools and his mate. There were, besides Farrant, another jointer called Humphries and Mr. Wootten, the assistant engineer, at the works. Farrant was given instructions as to what was to be done, and all three went into the switchroom, where the work was pointed out. Farrant remained behind. A few minutes afterwards a shout was heard, and Farrant was found in the switchroom, where a current at 11,000 volts had passed through his body. He was taken to the hospital, where he died. Defendants said that their workmen had strict prohibitive orders against going into the switchroom under any circumstances. They further said that in any event it was an unnecessary risk that was incurred by Farrant in going into the switchroom, where he would not have to do any work directly. Furthermore, they said that if he had to go there at any time that time had not arrived when he met with his death. The widow's answer to that defence was that the door leading to the switchroom should be strictly kept locked. If the defendants were going to do any work in the switchroom then Farrant must necessarily go inside. A bricklayer was making a hole through the wall, and he was in and out of the switchroom all the morning. Therefore if there was a prohibition against anybody going into the switchroom it should have applied to the bricklayer as well. Then the prohibition would disappear where work was being done which involved going into the switchroom, otherwise the workmen would not be able to see what they were doing. There was no doubt in a case of absolute prohibition the applicant could have no right to recover. In a case where a man thought he had a right and had none, then he could not recover. The defendants had set up that Farrant's work did not commence until after mid-day, when the switch pillar would be dead. No such information was ever given to Farrant.

William Rose, Farrant's mate, said that the door leading to the switchroom was not unlocked until Mr. Wootton, one of the defendants' superintendents, unlocked it and took Farrant in there.

Ernest Cannell, architect and surveyor, Martin's Lane, Cannon Street, produced plans of the building in question. He could not see inside the switchroom when he viewed the premises, as permission was refused.

Fletcher Elliott, bricklayer in the employment of the defendants, called on behalf of the plaintiff, said he was doing some work at the sub-station in question and was cutting down some brick work. He was in the switchroom at 9.30 with Bulger, the foreman of the fitters. Bulger opened the door to see what was dead or what was alive inside. When Bulger unlocked the door he showed witness which was alive and which was dead. He pushed his head through the hole which he had made in the wall and then there came a flash right across his face. Farrant, who was inside, hallooed out and fell. Farrant struck against the wall and his neck was in flames. Witness tore Farrant's collar off, as it was burning, and witness burnt his finger in the process. In dropping down to get Farrant out witness fell in the excitement. He would not go into the switchroom without permission, but even then he would want to know which was alive and which was dead. He was cutting behind a dead switch.

Herbert Humphrey, cable jointer in the service of the defendants, was also called in support of the plaintiff's case. He said he had instructions to go to the works in question and await Wootton's orders. He knew that work was not to begin until after the cables had been made dead. Wootton told him he was going to make the cables dead.

For the defence, Mr. Alfred Wootton, assistant engineer to the defendants, was called, and said he had been in their employment for 23 years. He was in charge of the work in question, and deceased worked under him. The main switch in question supplied the power for a considerable section from Streatham to Beddington, and the current which passed through Farrant's body was at 11,000 volts. He unlocked the door and went into the switchroom on the threshold, Humphreys going with him. He did not go amongst the electrical appliances. Before beginning the work it was necessary for the main to be shut down, which made the cable dead. He had explained all that to Farrant and the others, and at the time of his explanation the cable was alive. Having given the explanation he then went to the transformer room, but before leaving his position in the switchroom he closed the door. Witness was in charge of the whole building and had a key. Bulger also had one. In order for anyone to go into the switchroom it was necessary to get witness's permission. He was an authorised person under the Factory and Workshop Regulations. He gave no permission to Farrant to go into the switchroom, and he therefore had no business to have gone there until he had ascertained that the current was turned off. Cross-examined, witness said he did not suggest that Farrant knew that work was not to commence until mid-day. If Farrant received an 11,000-volt shock he must have come in contact with the live ends of the cable of the switch.

Bulger, defendants' foreman, said there was no reason whatever why Farrant should have gone into the switchroom. He distinctly told Humphreys that no work was to be done until mid-day, and at that time Farrant was standing within five or six feet. The cables were to be shut down before any work was done. That was said in a sufficiently loud tone to be heard by Farrant.

Mr. James Dallas, M.I.E.E., main superintendent for the respondents, said he had occupied that position for 24 years. He produced the book of signatures, including one of Farrant's, showing that he had received the rules governing the business. The regulations were issued to all the workers.

The Deputy Judge said he supposed Farrant had no right to go into the switchroom while the cable was live, but the question was did Farrant know that.

The witness said cable jointers would know what was alive and what was dead. He did not pretend to understand Home Office regulations. Nobody did understand all of them. If a locked door was a guard then the switches were guarded, and if not they were not. All switches had to be enclosed in iron. The reason the entrance to the switchroom was not guarded, if it was not, was because it was a "place apart." If there was a place apart and he as an authorised person had to guard the door by locking it then that was essential. If the door was left ajar it was not a safe place, and it was not guarded. It was a place apart, and Farrant had no right to go in.

The Deputy Judge said he did not want to hurry them over the legal arguments, because the case was on the border line. He therefore adjourned the further hearing until the morrow.

THE ELECTRICITY SUPPLY BILL.

On Thursday last week the Electricity (Supply) Bill came before the House of Commons on the Report stage. Mr. Shortt moved a new clause transferring the powers and duties of the Board of Trade under any and every Act relating to the supply of electricity to the Minister of Transport; this clause had been rejected by Standing Committee B. Sir A. Geddes supported the motion, and Sir J. Fortescue Flannery stated that the Provincial Association of Electric Supply Companies was in favour of it. Mr. G. Balfour opposed the clause. Sir Eric Geddes, supporting the motion, expressed the opinion that this course was best for the promotion of electric power in the country; he agreed that there was a good deal to be said in opposition to it, and that the Chief Commissioner must be absolutely independent, but he had arrived at a complete understanding with Sir John Snell, who was quite willing to transfer. The clause was read a second time without a division. An amendment by Mr. Shortt provided that the Electricity Commissioners should be appointed by the Minister of Transport with the concurrence of the Board of Trade, and another required that they should have no financial interest in any electricity supply undertaking.

Amendments providing for the specific representation of County Councils on district electricity boards, and that the local authorities' representatives should form the majority, were rejected—the latter by 153 to 54 votes.

On Clause 7 (acquisition of generating stations), Mr. Shortt moved the adjournment, and on the resumption of the debate on Monday, he withdrew an amendment which would have brought the railway and dock generating stations within the scope of the clause, explaining that he had forgotten an agreement which he had made with the authorities concerned.

An amendment providing that the owners of generating stations which were purchased should receive "compensa-

tion" instead of being paid the standard price was opposed by the Government, but was supported by several members on the ground that the present terms of purchase were unfair and constituted a breach of faith with the electricity undertakings; it was eventually rejected by 204 votes to 44.

An amendment moved by Mr. G. Balfour, bringing appreciation as well as depreciation into the determination of the standard price for stations and transmission lines owned by companies, was opposed by Mr. Shortt, who stated that any appreciation that might have taken place amounted to war profits. The amendment was negatived, but a proviso was moved by Mr. Bridgeman authorising the Electricity Commissioners, if convinced that the standard price in any particular case would work an injustice, to refer the matter to arbitration.

Mr. Bridgeman moved an amendment giving local authorities the option of receiving payment either in annuities or by a capital sum calculated in the same way as in the case of a company.

An amendment moved by Mr. G. Balfour, defining the purchase price of the remainder of an undertaking as the capital expended on it before and after the date when the generating station or transmission lines were vested in a district electricity board, was accepted, but a proposal to take depreciation into account was opposed by the Government, Mr. Shortt pointing out that buying out an undertaking was very different from dealing with a portion of it, and they must treat the seller as one who would have had the opportunity, if left alone, of recouping the capital expended during his 42 years' tenure.

Other amendments were made, and the debate was adjourned. The Report stage was concluded on Tuesday.

A memorandum on the Bill has been circulated by Mr. Andrew Gemmell, of Ovingham-on-Tyne, in which he draws attention to the methods of control adopted by the Newcastle-on-Tyne Electric Supply Co., Ltd., and its associated companies, and calls for an impartial investigation of the system of operation, so that safeguards can be provided in the Bill for the protection of the public interests.

BUSINESS NOTES.

British Magnetos.—There has been issued by the Publicity Department of the British Ignition Apparatus Association, 8, Bream's Buildings, London, E.C. 4, a 24-page booklet, entitled "British Magnetos," in which instructive information is given respecting what we may call the magneto position in this country. Whereas in the year 1913-14 the British output of magnetos was only 1,140, the war-time developments made by firms belonging to the above Association were on such a scale that from 1914 to 1918 they produced over 300,000. A remarkable curve of increase for the period is shown. Illustrations appear of magnetos produced by the following companies:—

British L. M. Ericsson Manufacturing Co., Ltd.; British Thomson-Houston Co. Ltd.; E.I.C. Magnetos, Ltd.; M.L. Magneto Syndicate, Ltd.; North & Sons, Ltd.; Thomson-Bennett Magnetos, Ltd.; and C. A. Vandervell & Co., Ltd. Copies of the pamphlet will be forwarded to any reader on application.

Patent Extension.—A petition for the extension of the term of the Patent No. 5,546, of 1907, granted to A. L. Hitchcock-Spencer and P. A. Sharman (W. H. Spencer & Co., of Hitchin), for "Improvements in vertical steam boilers," will be heard on January 13th, 1920.

American Electrical Activity: Rising Prices.—From the *Bulletin* issued by the *Electrical World* under date November 8th:—"Almost without exception, manufacturers and jobbers of electrical material are having an unprecedented volume of business. Products involving steel are becoming less plentiful, and shipments are continually lengthening. Difficulties of transportation and of labour in the factories, and the heavy ordering, are making it extremely difficult for jobbers to procure sufficient stocks of most materials. This is particularly true of materials for use in house wiring except wire which is becoming more plentiful.

"Price increases are shown for iron boxes, 17 per cent.; line construction tools, 10 per cent.; electric elevators, 10 per cent.; and time switches, 20 per cent. In addition, Atlanta district reports withdrawal of prices on flexible armoured conductor. Motor and transformer advances are in the wind, but no producer has been found who will admit anything definite."

Lamp Prices in Italy.—The text of a Decree has been published in Italy in connection with the payment of the lamp monopoly duty, stipulating that the prices of home-made or imported lamps shall not be lower, in any case, than as follows:—Carbon-filament lamps, 1·60 lire; wire-filament lamps of any type up to 60 C.P., 3 lire; wire lamps from 60 C.P. to 250 C.P., 6 lire; from 250 to 900 C.P., 16 lire; and lamps of higher C.P., 24 lire.

Copper Prices.—Messrs. James & Shakespeare report, November 25th:—Copper bars (best selected), ditto sheets, ditto rods, no change.

Messrs. F. Smith & Co. report, November 25th:—Electrolytic bars, £115, £3 decrease; ditto sheets, no change; ditto wire rods, £123, £5 decrease; ditto H.C. wire, 1s. 3½d., ¼d. decrease.

Brazilian Trade and Industry.—The September *Bulletin* of the British Chamber of Commerce in Brazil (Inc.), says:—In Brazil, with its tariff-inflated cost of existence, labour can never be cheap and materials can only be imported from distant countries and subject to heavy duties unless special exemptions are allowed. Exemptions again are too precarious to form a good basis for a general movement of expansion. It seems paradoxical to say that a system of tariff protection for national industries is the chief barrier to their development, but such is really the case. The general level of cost in the country has been so raised that in normal times nothing short of a practical prohibition of importation can enable Brazilian home manufactures of many kinds to compete. During the war when many articles could not be imported, a number of national industries sprang into being. As regards iron and metal goods, many articles, including machinery parts, were made locally to fill the place of what could not be imported. The importance of Brazil's iron resources, however, does not lie in local industries for home supply; it lies in the export of ore or of the metal—if the ore can be reduced to metal at a low cost in Brazil, then millions of tons are made available for European and other markets. If, on the hand, the ore has to be exported, the cost of rail and rolling stock, besides freight for the ore in bulk must continue to weigh heavily against Brazilian export. For the time being, therefore, Brazil is only a potential seller of iron ore on a great scale, and must continue to import iron and steel materials and manufactures. There is, and must continue to be for some time, a great demand in Brazil for iron and steel imports. The U.S.A. has been the chief source of supply during the years of shortage and it now lies with other iron and steel exporting countries to regain their footing as far as they can. The elements of competition are cheapness of production, low freights, range, quality, and suitability of products, and rapidity in execution of orders. British manufacturers should not fail to give close attention to this important market. They should also encourage Brazilians in the development of their iron resources and industries, for these will create demands for machinery and other supplies.

Social Events.—On the evening of the 14th inst., the Staff Association of the Edison Swan Electric Co., at Ponders End, provided a concert for the members and their friends. It was largely attended, and much appreciated. Mr. J. Bacon, the chairman of the Association, presided. The artistes were:—Miss N. Goudie, soprano; Miss C. Vincent, elocutionist; Mr. H. G. Holyday, baritone; Mr. Will May, humorist; Mr. A. Spilman, comedian; Mr. W. F. Ingamells, humorist and ventriloquist, and Mr. Haydon Pearsall, accompanist. On the evening of Saturday, the 15th inst., the Ediswan Cricket Club held its annual dinner and concert in the Staff Café, the chair and vice-chair being occupied respectively by Mr. J. Bacon and Dr. C. E. Hiatt. The chairman, in a brief speech, traced the history of the club since its formation in 1907. He said that during the war the men had been playing a far sterner game, but they had been able to resume play this year, and had had a most successful season. They had a playing membership of 34, and an honorary membership of 29. The chairman then presented the prizes, after which Mr. E. Russell, hon. sec., was presented with a set of gold cuff links and studs, as a mark of appreciation for his services to the club. The toast of "The Visitors" was proposed by Dr. Hiatt, and Mr. J. W. Elliott proposed "The Officers of the Club," acknowledged by Mr. R. Hood. An enjoyable musical programme was furnished, under the direction of Mr. E. S. Anderton, by Messrs. W. Vaughan, S. Bryant, H. G. Holyday, J. Belcher, W. F. Ingamells, J. Hilliard, Little Jack, J. Ganderton, Will May, and F. W. Roberts.

Duties on Lamps to Australia.—According to the Melbourne *Age*, in the House of Representatives on September 12th, Mr. Gregory (W.A.) referred to a Press statement made by a metropolitan newspaper that higher duties were imposed on electrical goods of British manufacture than on those of foreign manufacture. Was it true, he asked, that the duty on Japanese lamps was 2½d., on Dutch 2½d., and on British 5d.? Was it not possible to prevent such anomalies if they existed?

The Minister of Customs replied that electric lamps were subject to *ad valorem* duties. The basis of value for duty was the price at which similar lamps were sold in similar quantities in the domestic trade of the country of export. In the countries of export, Dutch and Japanese lamps were sold at a much lower price than those of British manufacture. The latter, however, were invoiced to their Australian branch houses and other importers at a special export price. The difference arose because the rate of duty depended on the home consumption value of the article. Under the present law it was not possible to overcome the anomaly referred to.

Lead.—In their report, dated November 22nd, Messrs. G. Cawson & Co. stated:—

The market kept fairly steady at £24 5s. to £24 15s. until 19th inst., when speculators started buying again, and as there was only a limited quantity of lead offering, the price was suddenly rushed up about 20s. to 22s. 6d. per ton, with business done at £25 to £25 15s. per ton. This movement made further progress yesterday, when business was done from £26 up to £26 7s. 6d., closing with buyers at £26 5s. in all positions. There has again been some consumptive demand both from rollers and also from the electrical trade. . . . . The outlook points to a continued firm market, and, perhaps, even some further advance in price should speculators continue their operations.

Messrs. James Forster & Co., reporting on the same date, stated:—

Metal for early delivery is in good request, at a trifle over £26 7s. 6d., principally for London, where the Government stock is practically exhausted. . . . There has been a fair inquiry from the Continent, but home consumers are not showing much disposition to place orders for anything beyond their immediate requirements.

Messrs. James & Shakespeare report that the price of English pig lead on Tuesday, November 25th, had advanced to £37 15s., an increase of 50s. for the week.

Book Notices.—Technical Paper of the Bureau of Standards No. 139, entitled "Some Tests of Light Aluminium Casting Alloys; the Effect of Heat-treatment."—The mechanical properties of a number of different compositions of light cast aluminium alloys have been determined, as well as the resistance to the action of alternating stresses of three commonly-used alloys. Comparison was made of the resistance of some well-known alloys to corrosion in the salt spray test. It was found that the effect of heat-treatment of cast alloys, consisting of annealing at 500° C. and cooling in air from that temperature, followed by aging for several days before testing, produced an increase in the tensile strength and the hardness, with an attendant decrease, usually, in the elongation. The application of such a heat-treatment to light aluminum castings seems to have commercial possibilities.

"The I.E.E. Regulations for the Electrical Equipment of Ships." First Edition. September, 1919. Pp. xvii + 62; 13 tables. London: E. & F. N. Spon, Ltd. Price 3s. 6d. net cloth; 2s. 6d. net paper covers.

"Technical Schools, &c. (Amending) Regulations (No. 2), 1919."—Draft, dated October 28th, 1919, of the regulations proposed to be made by the Board of Education. London: H.M. Stationery Office. Price 1d.

"The Principles of Electrical Engineering and their Application." By G. Kapp. Vol. II. Pp. viii + 388; 173 figs. London: E. Arnold. Price 18s. net.

Electrical Wages in New South Wales.—On behalf of the Electrical Trades Union of New South Wales, an application was made before Judge Rollin, in September, for a variation of the award governing the industry covered by the Government Railway and Tramways (Electricians') Board. According to the Sydney *Daily Telegraph*, Mr. H. J. Wormald appeared for the Government Tramways Electrical Branch Workers' Association, and Mr. Bretnall for the Railway Commissioners. By consent, his Honour varied the award as follows:—

Electrical fitters, 15s. a day, with an extra 6d. a day when employed at the power house; electrical tests and electrical mechanics on running testers, 15s. 6d. a day; battery mechanics, 15s.; electrical mechanics, 14s.; mechanics on construction line, 13s. 8d.; maintenance linesmen, 14s. 8d.; cable jointers, 15s.; arc lamp trimmers, 12s.; overhead line testers, 10s. 10d.; railway electricians, Sydney yard, 14s. 6d., when in charge of squad an extra 1s. a day; electrician in charge of construction, 16s. 8d., in country and suburban sections, £4 18s. a week; shift electricians (D.C. Board power house), 16s. 8d. a day; sub-station shift electricians (probationers), 14s. 4d. a day, thereafter, 15s. 4d., 16s., and 16s. 8d. a day; assistants, A.C. Board, 12s. 2d.; dynamo attendant, 12s. 8d.; battery attendant, 10s. 8d.; shift electricians (country and suburban generating stations), 15s. 4d.; senior shift electricians (Clyde), 16s. 4d.

The Iron-Moulders' Strike. — It is stated that 4,000 engine-builders at the L. & N.W. works at Crewe have been put on reduced time owing to the continuation of this strike and the shortage of castings.

An attempt was made, last week, to reopen negotiations between the Engineering Employers' Federation and the Unions.

45,000 men were on strike, last week, and it was stated in the House of Commons that the number of people unemployed as the result of the strike was 75,000.

More than 8,000 Scottish iron-moulders handed in their notices last week, but it was stated on Wednesday that they had withdrawn them.

Electrical Manufacturing in Australia.—In the course of a speech at the annual meeting of Amalgamated Wireless (Australasia), Ltd., at Sydney, early in September, the chairman, Sir Thomas Hughes, said that, realising the national importance of the electrical industry, and having proved that the company could manufacture the highest grades of electrical instruments and apparatus, the directors looked forward to extending their manufacturing work as soon as the Commonwealth policy of fostering such industries was definitely assured. The company had one of the best-equipped electrical workshops in the State, in which they could produce electrical apparatus both for wireless and general electrical purposes. If the wireless industry was given every opportunity to develop in that country, their manufacturing work would undoubtedly extend. The general electrical section of their manufacturing business was now conducted by the Australectric Co., which the directors had registered in the company's name for that purpose. The Australectric Co. would also look after the agency for the relay automatic telephone system, for which they had both the selling and manufacturing rights in Australia and New Zealand.

Engineering Wages.—Men of 18 and over employed in the Belfast engineering and shipbuilding trades have been awarded an increase of 5s. per week. They asked for 15s.

The Dutch Lamp Export Veto.—The Dutch Minister for Industry announces that as from November 18th the veto has been withdrawn on electric glow lamps falling under the export embargo on all metals in any form. At the same time, the export veto has been removed on the export of pocket electric lamps and parts thereof and on the raw materials for their production.

Certified Establishments.—The Ministry of Munitions has revoked the certificates granted to establishments and undertakings for the supply of light, heat, water, power and tramway facilities for the purpose of carrying on munition work.

Liquidations and Dissolutions.—I. Frankenburg and Sons, Greengate Rubber Works, Salford.—Winding up voluntarily for the purposes of amalgamation already referred to here. Liquidator, Mr. F. T. Woolley, 71, King Street, Manchester.

Irwell & Eastern Rubber Co., Mill Street, Salford.—Winding up voluntarily for reconstruction purposes (as above. Liquidator, Mr. W. Bolton, 46, Pall Mall, Manchester.

Lodge Sparking Plug Co., Ltd., 6, Bennett's Hill, Birmingham.—Winding-up voluntarily for reconstruction purposes. Liquidator, Mr. F. B. Lodge, St. Peter's Road, Rugby. A new company is to be formed with the same name. Meeting of creditors at Rugby, December 3rd. Claims must be sent to the liquidator by December 31st.

Renew Electric Lamp Co., Ltd.—Meeting of creditors at 5, Chancery Lane, W.C., December 1st. Claims must be sent to the liquidator, Mr. B. B. McCallum, at 5, Chancery Lane, W.C. Winding up voluntarily to enter into agreement with the Aladdin Renew Electric Lamp Corporation, Ltd.

Electro Flux Steel Co., Ltd.—Meeting called for December 22nd, at Pilgrim House, Pilgrim Street, Newcaste, to hear an account of the winding-up from the liquidator, Mr. B. A. Fitzgerald.

Warwick & Oldham, electrical engineers, 124, Well Lane, and 162, Whetstone Lane, Birkenhead.—Messrs. N. Warwick and H. Oldham have dissolved partnership.

Tilling Stevens, Ltd.—Winding up voluntarily for reconstruction purposes. Liquidator, Mr. M. Lancaster, 1, Basinghall Street, E.C.

Gilbert White Engineering Co., electrical and motor engineers, 33, King's Road, Hay Mills, Birmingham.—Mr. N. W. Gilbert and T. W. White have dissolved partnership.

Parliamentary Notices.—A number of applications which are being made to Parliament for electrical powers appear in the *London Gazette* for November 21st and 25th. Several applications are by Corporations for powers to run motor-omnibuses and to require bodies and persons working any such service to contribute to the maintenance of the roads and streets. We shall refer to the applications in the usual form when the collection is complete.

Trade Announcements.—Owing to increased business in the electrical and general engineering contracting department hitherto carried on by the Canute Airplane Co., Ltd., Sugar House Lane, Southampton, a new company was registered on Nov. 14th, which will trade under the name of Cray Installations, Ltd., with office, showroom, and stores at 72B, High Street, Southampton. Catalogues are desired. Captain J. Young, A.M.I.E.E., who since his demobilisation from the R.A.F. in May last has managed the department, has been appointed managing director of the company.

Messrs. Vickers, Ltd., have bought St. Ermin's Hotel, Westminster, for office purposes, at £400,000.

The premises lately occupied by Mr. H. Nesai at 46, Market Street, Heywood, are to be opened by Messrs. T. Fearing & Co., electrical engineers.

Among the new joint-stock companies registered in Scotland during the week was T. A. Kinnaird & Co., electrical and mechanical engineers, Greenock, with a capital of £25,000 in £1 shares.

The Enterprise Manufacturing Co. have appointed the Dawson Electric Co., of St. Peter's Church Walk, Nottingham, as their sole agents for Nottinghamshire and Lincolnshire.

Mr. J. F. Buglass, who for some years has been manager of the electrical department at Messrs. T. C. Keay, Ltd., Dundee, and Mr. W. E. Jamieson, A.M.I.E.E., who has been on the engineering staff of the Dundee Corporation electricity department since 1910, have started in business as electrical engineers at 65, Trades Lane, Dundee. A private limited company is in course of formation. They desire to receive catalogues.

Messrs. J. A. Kinnaird & Co., Ltd., who have just commenced business as contracting electrical and mechanical engineers at 10, Blythswood Square, Glasgow, desire to receive manufacturers' catalogues of electrical machinery, appliances, switchgear and accessories.

New French Electrical Companies.—The following new companies have been formed:—Hurrise et Cie.; capital, 220,000 fr.; trade in electrical material, representation, importation and exportation; offices, Levallois. Compagnie Générale de Téléphonie et Electricité, Paris; capital, 1,000,000 fr.; manufacture and sale of electric and telephonic apparatus. Compagnie Nomande d'Exploitations Electriques; capital, 100,000 fr.; offices, Paris. Société des Appareils, Electriques "Pax," Paris; manufacture and sale of "Pax" magnetos, converters, and other electric apparatus; capital, 600,000 fr. La Téléphonie Universelle, H. Lederlin et Cie., Paris; installation and upkeep of telephone apparatus in France and abroad; capital, 120,000 fr. Tuzet, Pradeau et Sigaud, Paris; capital, 110,000 fr.; oversight and carrying out of all kinds of electric works. Dodo et Prévost, Paris; capital, 58,000 fr.; electric installations and supplies. Société pour l'Exploitation des Procédés et Brevets des Usines Jean Gallay, Puteaux, Seine; capital, 800,000 fr.; metallic appliances applicable to electrical uses.

Under the style of "La Pébéo," has just been formed, at St. Marcel, a suburb of Marseilles, a company with a capital of 525,000 fr., for the manufacture of litharge, minium, colours and oxides of lead by means of electricity.

The hitherto unused deposits of quartz in which the Departement de la Lozère abounds are about to be utilised by a newly-created company, which proposes to set up electric smelting works at Marvéjols, in that department.

Catalogues and Lists.—Metal Industries, Ltd., Sunbury-on-Thames.—Pamphlet on rendering iron and steel rustless by an improved process of sherardising.

The Quasi-Arc Co., Ltd., 3, Laurence Pountney Hill, Cannon Street, London, E.C. 4.—Pamphlet dealing with welded ships in steel and iron by the quasi-arc process of electric welding.

Automatic and Electric Furnaces, Ltd., 281-283, Gray's Inn Road, London, W.C. 1.—Leaflet dealing with a new electric radiation furnace; heat treatment bulletin, No. 16, on the magnetic selerometer and its uses.

Sterling Telephone & Electric Co., Ltd., 210, Tottenham Court Road, W. 1.—"Souvenir of Sterling Progress," recording the development of the business from its establishment by Mr. Guy Burney in 1900 to the present date; the souvenir contains admirable half-tone illustrations of all departments of the offices and the Dagenham works, where 2,500 hands were employed during the war.

Petrol Control Department Closed.—The Petrol Control Department, 20, Berkeley Street, W. 1, was closed down on November 22nd. All further communications in connection with the matter hitherto dealt with by that Department should be addressed to Mr. P. G. L. Webb, C.B., C.B.E., at the Patent Office, 25, Southampton Buildings, Chancery Lane, W.C. 2.

Sweden and Australian Trade.—The journal published by the Swedish Chamber of Commerce at Sydney, recently published an article giving a survey of the trading possibilities for Swedish firms in Australia. After referring to machine tools, internal combustion engines of small powers and suction gas engines of up to 400 h.p., the journal raises the question of electrical machinery and accessories, for which Australia offers a great market right from small lamps up to generators of 5,000 kw. Electric tramways are stated to be destined to supersede omnibuses, and all new vehicles are being built on the electric system. In the case of the railways, which are owned by the State, preparations are being made to change over from steam to electric traction. The State of Victoria is the most advanced in this respect, as one of the largest suburban lines has been reconstructed at a considerable expenditure, but this is only a beginning as the other lines in the State are to be similarly transformed as soon as possible. It is expected that the underground railway which is in course of construction at Sydney will be equipped for electrical operation, and the opinion prevails that the other railways in New South Wales will also be converted to electric traction. It is added that all the railways in Australia will be transformed to electrical working in the course of time.

LIGHTING AND POWER NOTES.

Bath.—Loan.—The E.C. is asking for permission to borrow £15,000 for the provision of new mains to be laid in the Tiverton district.

Batley.—Price Increase.—The price of electricity has been increased for power and heating by a further 15 per cent., making a total war advance of 115 per cent.

Bingley.—Price Increase.—It has been agreed to pay Bradford Corporation 2·009d., instead of 1·842d., per unit for electricity supplied for tramway purposes, with the proviso that the agreement shall be revised yearly, instead of every five years, the next revision to be made in 1920.

The Electricity and Tramways Committee recommended the T.C. to increase the price of electricity for lighting, heating, and power purposes.

Blackburn.—Electricity *v.* Gas.—The Board of Guardians has found its gas supply so costly that a Sub-Committee has gone into the matter, and reported that by adopting electricity the Board could effect a saving of 25 per cent. on the lighting bills.

Carisbrooke and Northwood.—Overhead Transmission.—The Isle of Wight E.L. and P. Co. has applied to the B. of T. for permission to erect overhead lines in the district, at a pressure of 2,600 volts.

Chesterfield.—Loans.—The Corporation is advertising for loans for several public works, the chief of which is the extension of the municipal electricity works.

Price Increase.—At the meeting of the T.C., on December 2nd, a resolution will be moved that on and from the last meter readings the present total charges for electricity for private and public lighting will be further advanced by an amount equivalent to 75 per cent. on pre-war rates.

Dover.—Minimum Charge.—The T.C. is to re-consider the imposition of a minimum charge of 14s. per year for electricity.

Dundalk.—Shop Lighting.—The U.C. has recommended the restriction of shop lighting for the present owing to the heavy load demanded during the winter and risk of failure in electricity supply during the replating of a storage battery. It was reported that no new electrical connections could be made because of shortage of meters, which were, however, on order.

Epsom.—Price Increase.—The U.D.C. is applying for an order to increase the charge for electricity from 8d. to 1s. per unit. The R.D.C. objects on the ground that it would be more economical for the U.D.C. to obtain a supply in bulk.

Eston.—Prov. Order.—The U.D.C. is applying for a prov. order to supply and distribute electrical energy for public and private purposes.

Glasgow.—Mercury Rectifiers.—Councillor Sadler, sub-convener of the E.C., and Mr. W. W. Lackie, electrical engineer, have submitted a report on their recent visit to Switzerland, in connection with the proposal to install Brown, Boveri mercury-vapour rectifiers at the electricity works. It is pointed out that the rectifiers are more efficient and economical than mechanical converters. The principal points noted were:—Silence in operation, which was of benefit if sub-stations were erected in housing areas; small space occupied, and light weight; small amount of attendance necessary; absence of heavy running machinery; and the rapidity with which starting up and shutting down could be effected. The Committee is to ask for a definite quotation for an installation of rectifiers, to consist of four cylinders, each of 330 h.p., to be installed in Waterloo Street sub-station. The current price of a 330-h.p. motor-generator or rotary converter was about £1,600, and the rectifier would be no less, but the annual saving would warrant the capital expenditure involved.

Guildford.—Expert Advice.—The power users in the town have asked the T.C. to consider the advisability of negotiating for the purchase of the undertaking of the E.S. Co., and have requested the company to appoint an independent expert to be nominated by the I.E.E. to report on the present condition of the plant, &c., with special reference to the stand-by plant, and condition of the mains.

Horwich.—E.L. Scheme.—The U.D.C. has under consideration the question of an electricity supply, and has received the terms of the Bolton Corporation and the Lancs. E.P. Co. for a supply in bulk.

Hexham.—Extensions.—Mr. F. M. Gascoigne, solicitor acting on behalf of a syndicate, has completed negotiations for acquiring Hexham E.L. Co., as from December 31st. The generating plant is to be duplicated, and provision is being made to supply energy for power and heating. Messrs. Christy Bros. and Co., Chelmsford, are to be retained as technical advisers.

Hull.—New Plant.—In order to avert a breakdown such as occurred recently, the E.C. is to purchase new plant, estimated to cost £46,000. The engineer (Mr. Herbert Bell) explaining the breakdown, said that on November 4th at 4 p.m., when the generating plant was carrying a load of about 9,000 kw., a disturbance of the division of the load between the A.C. and D.C. plant occurred, with the result that the protective apparatus of a large number of transformers principally on the positive side of the network in the centre of the city operated, resulting in a cessation of supply in the case of all users connected with the positive side of the network. Normal conditions were restored after sundry fuses in the switch pillars which had melted owing to overload, had been replaced. During the war, the increased maximum demand, which had grown at a slightly lower rate than during the five preceding years, was brought about largely by the connection of additional power users who were supplied through the medium of machinery and apparatus fixed specially for them. On the other hand, the lighting demand was, if anything, slightly reduced, although the Committee carried out certain extensions of turbine plant at the generating station, no corresponding machinery was installed for transforming any of this energy to supply the general D.C. network throughout the city. The net result was that the total output of transforming plant on the D.C. network was slightly less than it was in 1914, and this plant was at present seriously overloaded. Immediate steps must be taken, and the engineer placed before the Committee certain proposals to be carried into effect at once, which included motor converters and switchgear, £26,446; necessary 6,000-volt feeders to run the above, £19,878, or a total of £46,524. These additions are distinct from and additional to those arranged for in May last. With regard to the new consumers, there were 360 awaiting a supply, and further applications were being received at the rate of about 120 per month; it was essential to use the greatest discrimination in connecting consumers. The engineer's recommendations were adopted.

Street Lighting.—In order to bring about effective competition with the British Gas Light Co., the Corporation Water and Gas Committee is to seek a conference with the Electricity Committee for the extended use of electricity for street lighting.

Harrogate.—Year's Working.—The annual accounts for the year ended March 25th last, show that the total income was £22,333; expenditure, £13,830; an amount of £8,503 being carried to net revenue account. The maximum supply demanded was 1,000 kw.; units generated numbered 2,409,461; units sold, 1,712,428; public lighting, 46,853; by contract, 8,820; private consumers, 1,656,755.

Lancaster.—Mains Extensions.—It has been decided to extend the mains to Skerton if the application for energy justifies it, and the usual guarantees are entered into. Alderman Huntington has been elected chairman of the Electricity Committee.

Letterkenny.—Loan.—The U.C. is to apply for a loan of £10,000 in connection with the E.L. scheme, for which suction gas is to be used.

London.—District Board.—It is understood that the L.C.C. proposes to confer with authorities in Greater London now owning municipal electricity undertakings, with a view to the preparation of a comprehensive scheme of electricity supply for Greater London.

Mansfield (Notts.).—Loans Sanction.—The M. of H. has sanctioned the following loans:—£20,500 for the extension of the plant, £14,000 for new buildings, and £500 for a motor-generator.

Masham.—The U.D.C. is making application to Parliament for powers to purchase the Masham and District Electricity Co. and the Masham Gas Co.

Newcastle (Co. Down).—Water Power.—Mr. Shannon, managing director of the E.L. Co., recently received a deputation with regard to an improved service. The Earl of Roden has refused permission for the use of water passing through Tollymore Park to provide an auxiliary system, and the question of utilising the water in the Glen River is being considered.

Portumna (Co. Galway).—Extensions.—The E.L. and P. Co. proposes erecting a power house.

Risca.—Bill.—The U.D.C. is applying for powers, by means of a Bill in Parliament, to supply electricity.

St. Helens (Lancs.).—£28,000 Contract Lost.—The daily Press reports that the tender of a Swiss firm for a turbo-alternator and condensing plant for the electricity works was accepted by the Council on the 20th inst., the price being £28,000, or £4,178 less than the lowest British offer. The Swiss firm guaranteed a fixed price, while the British price had already risen 7½ per cent. owing to the increase of wages.

St. Mellons.—Prov. Order.—Application is being made by the S. Wales E.P. Distribution Co. for a prov. order to empower it to supply electricity to 15 parishes in the R.D. of St. Mellons.

Tredegar.—Bill.—The U.D.C. is seeking powers, by means of a Bill in Parliament, to supply electricity, acquisition of land for a generating station, laying of mains, &c.

Walkden.—Extensions.—The Lancashire E.P. Co. is building a sub-station in Campbell Street, near the Walkden Spinning Co.'s large new mill. The Earl of Ellesmere is also having additional electrical installations put down in connection with his local collieries and workshops.

TRAMWAY AND RAILWAY NOTES.

Bradford.—Collision.—While a car was being changed from one set of lines to another, it commenced to run down a steep incline towards the city after the trolley pole had been taken off. A man on the car tried to apply the brakes, but without avail, and the car collided with another. Both cars were badly damaged, and one man was injured.

Cardiff.—Mr. Arthur Ellis informed the Tramways and E.L. Committee that if the traffic remained at its present density they could find work for 200 tramcars, instead of the 100 now in commission out of the 130 which the department owned. A suggestion that half fares for children should be allowed, was deferred for the consideration of the new tramways manager in succession to Mr. Ellis. It was reported that the Council would be advised to separate the offices of electrical engineer and tramways manager. An unusually long list of 258 applicants for electricity was received, and it was stated that there was still great difficulty in getting cables and meters.

Chesterfield.—Fare Increase.—The tramway fares have been increased, and on many of the sections 1½d. fares have been introduced.

Dover.—Time Extension.—The Ministry of Transport has informed the R.D.C. that an interim extension until February, 1920, for the construction of the Dover, St. Margaret's, and Martin Mill Light Railway, sanctioned in 1909, has been granted, pending consideration of the application for a five years' extension.

Edinburgh.—Proposed Fare Revision.—In a joint report to the T.C., the City Chamberlain and the tramway manager recommend a revision of fares. The establishment of a minimum 1½d. fare and the reversion to the 1½d. stages, which were abolished on July 1st, was suggested. To meet the deficiency of £21,543 they recommend that the present 1d. stages, which averaged 1,500 yards, should be abolished, and that the old 1½d. stages, averaging 1 mile 527 yards, be reintroduced. The stages for 2d. and 3d. should remain as at present. For children a half-fare was recommended as the rate which should be charged, but with a minimum of 1d. Only workmen's return tickets should be issued to persons travelling on cars leaving any terminus before 7.45 a.m. on week-days, and available for return at any time during the same day. These workmen's tickets would be at half-price. It was estimated that the various changes referred to would produce an increased revenue of £769 per week. A deficit of £5,394 would be left, and it was suggested that this should be carried forward to, and met out of, the revenue for the year 1920-21.

Egypt.—Turbulent scenes have occurred again similar to the events in March and April last. Since the prohibition of demonstrations, the practice of taking possession of the tramcars and compelling the drivers to follow certain routes has been adopted. It is reported that the tramway cars were withdrawn on the 17th inst., and that in Alexandria the lines have been torn up by the mob.

Grindleford-Hassop.—Railway Electrification.—The scheme for the construction of a new railway through the Peak, from Grindleford to Hassop, will link up the Dore and Chinley line with the Derby and Manchester main line. The new railway will be worked by electricity for both classes of traffic, the electric power being obtained from the River Derwent at Calder cotton mill, which has been acquired, and will now cease to be used for cotton spinning.

Halifax.—Bill.—Sanction has been given by the T.C. for the promotion of a Bill in Parliament seeking powers for extension schemes on the Corporation tramways outside the borough boundary, viz., Salterhebble to Elland, and Hebden Bridge to Whitley Arches (thus linking up with the 'buses belonging to the Todmorden Corporation). Within the borough two new lines are also projected—in Southgate and at Dudwell for the further development of the circular route sections. The Bill will also secure authority for the raising of the present tramway fare of 1d. per mile to 2d.

Fares.—The Corporation Tramways Committee is to abolish the the ½d. tramway fares for part distances, after the first mile has been covered, and make a charge of 1d. The fares on routes over one mile in length will be 2d., instead of 1½d.

Hastings.—Overhead System.—The Tramway Company has applied for powers to work the sea-front tramways on the overhead system, instead of by the present surface-contact system.

Huddersfield.—Bills.—The Corporation is promoting two Bills in Parliament, under which powers are being sought to extend the tramways. This includes the construction of a line from Fixby to Brighouse, terminating by a junction with the existing Halifax tramway. It is also desired to alter and increase the fares, rates, and charges in respect of the tramways, and powers are asked for to run motor-'buses beyond the borough.

Light Railways.—Sir A. Boscawen stated in Parliament, last week, that proposals for the construction of light railways in the agricultural districts had been received from 19 County Councils; the total mileage was 968 miles, but, so far as he was aware, no constructional work had actually been begun.

London.—L.C.C.—Tramway Extensions.—In Parliament last week, Mr. J. Skinner called attention to the action of the Office of Works in not permitting the posting of notices in Hyde Park calling attention to the proposal to run tramways through the park. The effect of the action of the Office of Works was, he said, that the House of Commons would be prevented from considering the scheme. Mr. H. H. Gordon said there had never been a case in which a Borough Council had refused to allow the L.C.C. under similar circumstances to comply with a technical legal requirement. It had been left to the Government to take this action to stop the scheme coming before Parliament. Mr. W. J. Squires (chairman of the Highways Committee) said he looked to the Government to explain its reasons for refusing to sanction that was asked for. The Council's Parliamentary officer did all he could to get the notices placed in a legitimate way, and if the Government refused, the onus must be upon them.

Accidents.—Two tramcars collided on Thursday, last week, in the Old Kent Road; three persons, including a motorman and conductor, were injured.

A line of L.C.C. tramcars, nearly a mile long, was held up by a breakdown at Vauxhall on Wednesday morning, last week.

Tube Extensions.—Powers are sought, under a private Bill promoted by the Central London Railway Co. and the Metropolitan District Railway Co., to link up the Central London tube with the railway to Richmond. A short stretch of the tube extension would be carried from a point underneath Uxbridge Road to the Shepherd's Bush Station of the Metropolitan line. It is proposed in the same connection to electrify the line from Shepherd's Bush to Richmond. Under a separate Bill the combined underground electric companies ask for legislative authority to increase or alter fares and rates.

Preston.—New Cars.—Six single-deck cars are recommended to be purchased from the Sheffield Corporation, at a cost of £350 each. The engineer is to submit an estimate of the cost of covering the fronts of all the Corporation's cars.

Year's Working.—The annual report on the tramways undertaking for the year ended March 31st shows that the revenue totalled £77,930; working expenses, £52,877; gross profit,

£25,054; old tramway debt, £1,290; total, £16,764, leaving a balance of £8,289. Revenue was increased from £63,498 by £14,433. Large additions to the renewals fund would be necessary, the cost of relaying now being £8,000 a mile, against £4,000 pre-war rate.

Railway Electrification.—Sir Eric Geddes, Minister of Transport, mentioned during the Electricity (Supply) Bill debate that schemes of electrification were under consideration by the Midland, Great Eastern, South-Eastern, and Brighton Railways.

St. Annes-on-Sea.—BILL.—The U.D.C. is to apply to Parliament for a Bill to enable it to purchase the Blackpool-Lytham tramway undertaking, at £140 000. The section of the line in Lytham, the Council proposes, should be purchased by the Lytham Council, and leased to St. Annes, or, alternatively, that the whole line be managed by a joint board.

Swansea.—TRAMWAY SCHEME ABANDONED.—The T.C. is to obtain powers to supply certain routes with omnibuses, a scheme for constructing tramways, at an estimated cost of £45,000 a mile, including street widening, being dropped.

Continental. — GERMANY. — The *Times* states that municipal tramway employés of Greater Berlin have decided to break away from the Union of Transport Workers, as they are unwilling to take part in hopeless strikes.

TELEGRAPH AND TELEPHONE NOTES.

Empire Wireless Chain.— A Committee has been appointed to prepare a complete scheme of Imperial wireless communications. The members are:—Sir Henry Norman, M.P. (chairman), Mr. F. J. Brown, Rear-Admiral F. L. Field, Sir John Snell, Prof. J. E. Petavel, Dr. W. H. Eccles, Mr. J. Swinburne, and Mr. L. B. Turner. Secretary, Brig.-General S. H. Wilson; assistant secretary, Lieut.-Colonel C. G. Crawley. Communications in connection with the Committee should be addressed to the Secretary, 2, Whitehall Gardens, London, S.W.

The Committee, which was appointed by the Secretary of State for the Colonies, as Chairman of the Imperial Communications Committee, and with the approval of the Cabinet, will consider what high-power wireless stations it is desirable on commercial and strategic grounds that the Empire should ultimately possess; estimate the capital and annual costs of each station, and the life of plant and buildings; examine the probable amount of traffic and revenue which may be expected from each station; and place the stations recommended in their order of urgency.

Italy. — The tariff for telegrams abroad has been increased 50 per cent. owing to the high rate of exchange.

Norway.—The Stavanger wireless station was ready for use about 12 months ago, but the Marine Department of the U.S.A., which took over the wireless service during the war, did not allow communication with Stavanger until November 20th, when traffic with America was opened. As soon as the Peace Treaty is ratified, Stavanger station will be taken over by the International Marconi Co.

Pacific Cable Project.—A marine cable by the northern route, connecting Cape Flattery, Washington, and Asia by way of Alaska and the Philippine Islands, is practical, and should suffer no interference from ice, is the opinion of War Department officials expressed in a report submitted to the Senate Commerce Committee considering legislation authorising the laying of a new trans-Pacific cable. The report, says the *T. and T. Age*, also recommends two auxiliary routes. One would be through arrangements with the wireless station at Anadyr, Siberia, to forward messages to Vladivostock, as the wireless station at Nome, Alaska, now can work with that station. The other would be the use of the present Alaskan cable to Valdez, Alaska, where a wireless station could be constructed to work with another station on the western limits of the Aleutian Islands, from which point a cable line could be constructed extending 1,600 miles to the Japanese Islands.

Sweden.—A wireless service, supplementary to the cable service, began on the 19th inst. between this country and Sweden. Messages intended for it should be marked "*Via* wireless," and handed in at a post office. The rates will be the same as by cable, namely, 2½d. a word for ordinary telegrams, and 1½d. a word for Press telegrams.

Uruguay.—A decree, authorising the resumption of telegraphic communication with Germany has been issued by the Uruguayan Government.

Wireless Telephony.—A notice to airmen, issued by the Air Ministry, states that the wireless telephony stations at the aerodromes at Hounslow and Lympne are now working on 900-metre wave length. The registration marks of aircraft should be used as the call signs in making or receiving signals by wireless telegraphy or other methods of communication, except when opening up communications by means of visual signals, when the usual methods should be employed.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared.)*

OPEN.

Australia.—SYDNEY.—City Council. January 5th, 1920. Electric Lighting Department. Outdoor H.T. switchgear (specification 566); air-brake switches (specification 565). Electric Lighting Department, Town Hall.—*Tenders.*

January 14th, 1921. N.S.W. Railways and Tramways Department. 70 3-phase induction motors for terminal wheat elevator.*

January 19th, 1920. Sub-station equipment (except power transformers). Contract No. 558.*

MELBOURNE. — P.M.G.'s Department. January 20th, 1920. Automatic telephone switchboard at Collingwood. Schedule 1,583. (September 19th.)

Belfast. — December 22nd. Electricity Department. Steam, water and other pipework for the New Harbour power station. (See this issue.)

Bolton.—December 10th. Electricity Committee. E.H.T. switchgear for the Back-o'th'-Bank generating station. (November 21st.)

Bournemouth.—December 15th. Tramways Committee. 20 bogie electric tramcars. Mr. J. Bulfin, General Manager, Tramways Office, Lansdowne Crescent.

Dublin.—December 10th. 12 months' supply of electrical supplies. Mr. N. Proud, Secretary, Port and Docks Office, Westmoreland Street, Dublin.

London.—L.C.C. December 9th. Overhead electrical equipment, low-tension cable, and laying stoneware ducts, &c., in connection with the construction of the Lee and Eltham tramway. (November 14th.)

Londonderry.—December 13th. Electricity Department. Two 500-KW. rotary converters with transformers, E.H.T. cubicles with switchgear, L.T. D.C. panels, cables, &c. (November 21st.)

Manchester. — December 1st. Rivers Department. Supply, &c., at Davyhulme sewage works, Urmston, of three 30-H.P., three-phase, induction motors, &c. Secretary of Rivers Department, Town Hall.

December 24th. Electricity Committee. Specification B1: two 25,000-KW. and two 1,000-KW., three-phase turbo-alternators, with condensing plant, &c. (November 14th.)

Plymouth.—December 5th. Corporation. Two water-tube boilers. (November 14th.)

Southampton.—December 1st. Electricity Department. 12,000 tons of small coal for 6 months from January 1st, 1920. Mr. H. S. Ellis, Borough Electrical Engineer, Electricity Works, Western Shore, Southampton.

South Africa.—JOHANNESBURG.—January 8th. Municipal Council. Copper wire, cable insulators and steel poles (Contract No. 548). Specification from Town Clerk, Municipal Offices, Johannesburg.—*B. of T. Journal.*

Tynemouth.—December 1st. Electricity Department. Cable. (October 31st.)

*A copy can be seen at the Inquiry Office of the Department of Overseas Trade (Development and Intelligence), London.

CLOSED.

Dumfries.—T.C.:—

E.L. installation, Town Hall and offices.—Dumfries Electricity Supply Co., £70.

Edinburgh.—The following is a list of the firms who tendered for the much-discussed Corporation contract for large turbo-alternator plant:—

Brown, Boveri & Co., Ltd., Baden, Switzerland.
Oerlikon, Vevey, Switzerland.
Escher, Wyss & Co., Zurich, Switzerland.
J. Howden & Co.
Daniel Adamson & Co.
Richardsons, Westgarth & Co., Ltd.
Fraser & Chalmers, Ltd.
British Thomson-Houston Co., Ltd.
Parsons & Co.
Belliss & Morcom, Ltd. (Vickers alternators).
English Electric Co.
Belliss & Morcom, Ltd. (G.E.C. alternator).
British Westinghouse Co., Ltd.

Grimsby.—T.C. Accepted. In connection with power-station extensions:—

Converting plant, £12,603.—Metropolitan-Vickers Electrical Co., Ltd.
30-ton electric travelling crane, £2,185.—Stothert & Pitt, Ltd.
Well boring, £694.—Smith & Son.
E.H.T. switchgear, £4,773.—New Switchgear Construction Co., Ltd.

Government Contracts.—The following contracts were placed during October, 1919 :—

Ministry of Munitions (War Office).

Rewinding, testing and erection of turbo-alternator.—General Electric Co., Ltd.

India Office (Store Department).

Baudot apparatus.—Elliott Bros., Ltd.
Telephone apparatus.—Peel-Conner Telephone Works, Ltd.
Bronze wire.—F. Smith & Co., Ltd.; Shropshire Iron Co., Ltd.; T. Bolton and Sons.
Condensers.—Automatic Telephone Mfg. Co., Ltd.
Copper wire.—Elliott's Metal Co.; Shropshire Iron Co., Ltd.
Core cable.—Siemens Bros. & Co., Ltd.
Insulator cups.—Taylor, Tunnicliffe & Co.
Dynamometers.—Heenan & Froude, Ltd.
Dynamos.—J. Stone & Co., Ltd.
Engines.—Lancashire Dynamo Co., Ltd.
Fans, &c.—Veritys, Ltd.
Insulators.—Bullers, Ltd.
Motors, &c.—Lancashire Dynamo Co., Ltd.
Transmitters, &c.—Creed & Co.
Radioscopic stands.—Newton & Wright, Ltd.

Post Office.

Laying conduits (short lengths, non-continuous).—City of London: J. A. Ewart, Ltd; Stepney: J. A. Ewart, Ltd.; Fulham, Battersea, Wandsworth and Merton: J. A. Ewart, Ltd.; Camberwell: W. H. Wheeler & Co., Ltd.; Hornsey: O. C. Summers; Kensington, &c.: O. C. Summers; Willesden, &c.: O. C. Summers; Finsbury, Holborn and Shoreditch: D. R. Paterson, Ltd.; St. Pancras: D. R. Paterson, Ltd.; Westminster and Chelsea: J. Mowlem & Co., Ltd.
Laying ducts, London—Manchester.—(Derbyshire—Manchester, section IV): J. F. Hodge & Co.; London—Manchester (Old Stratford—Loughborough, section III): W. Hodge & Sons.
Laying ducts and pipes.—London—Manchester (Old Stratford—Loughborough, section V.).—W. Hodge & Sons.
Laying ducts, pipes and troughing.—Isle of Dogs: J. Mowlem & Co., Ltd; Enfield (Grange Park): Grounds & Newton.
Laying ducts and troughing.—Streatham (Woodburne Avenue): W. H. Wheeler & Co., Ltd.
Telephone exchange equipment extension, Dublin.—Western Electric Co., Ltd.
Protective apparatus.—Phœnix Telephone & Electric Works, Ltd; Western Electric Co., Ltd.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Peel-Conner Telephone Works, Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Telegraph and telephone cable.—Connolly's (Blackley), Ltd.; Siemens Bros. and Co., Ltd.
Leclanché cells.—Siemens Bros. & Co., Ltd.
Earth clips.—Farmer & Co.
Coating brass bodies with ebonite.—India-Rubber, G.-P. & Telegraph Works Co., Ltd.; Western Electric Co., Ltd.
Conduit.—J. McDougall, Ltd.
Cords for telephones.—Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.
Ducts.—Sharp, Jones & Co., Ltd.
Insulators.—Bullers, Ltd.; Taylor, Tunnicliffe & Co.
Spindles for insulators.—Bayliss, Jones & Bayliss, Ltd.
Cable suspenders.—Spartan Mfg. Co., Ltd.
Bronze insulated wire.—B.I. & Helsby Cables, Ltd.
Copper wire.—T. Bolton & Sons, Ltd.; R. Johnson & Nephew, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., (incorporated with the London Electric Wire Co. & Smiths, Ltd.); Wilkes, Sons & Mapplebeck, Ltd.
Galvanised iron wire.—Rylands Bros., Ltd.

Crown Agents for the Colonies.

Battery materials.—Siemens Bros. & Co., Ltd.
Electrical fittings.—General Electric Co., Ltd.
Telephones.—British L.M. Ericsson Mfg. Co., Ltd.; Siemens Bros. & Co., Ltd.
Insulated wire.—Hooper's Telegraph & I.-R. Works, Ltd
Wireless set.—Marconi's Wireless Telegraph Co., Ltd.

H.M. Office of Works.

Engineering services (electric wiring, Alexandra Palace).—Alpha Mfg. Co., Ltd.

Public Works, Ireland.

Electrical work and supplies, Dublin district.—Handley & Robinson, Ltd.

Kettering.—U.D.C. Electricity Department. Cooling tower to deal with 170,000 gallons of water per hour :—

W. H. Roy & Co., Ltd.	£3,590
Film Cooling Towers Co.	2,780
Premier Cooler & Eng. Co.	£2,610, £144 = 2,750
C. Bradshaw & Co.	2,750
Clyne Engineering Co. (not complete)	2,610
Davenport Engineering Co. (prov. accepted) ..	**2660**

St. Helens.—At the Council meeting the Chairman of the Electricity Committee, in submitting a resolution accepting the tender of a Swiss firm, said that when the tenders were received they found that on the machine which was to cost £20,000, the Swiss firm offered a price which was £4,178 less than the tender of any English firm that they could recognise. The tender amounted to £28,700 altogether, and the amount above £20,000 was for a condensing plant, which would have to be laid by a Bolton firm. The Swiss firm had supplied a machine, after very close inquiry by the York Corporation, and it had worked satisfactorily for four years without ever needing overhaul. Alderman Bates said they accepted the Swiss tender because they guaranteed a fixed price of £20,000, which was a very big consideration. The chairman said no English firm would give delivery under a penalty, but the Swiss firm had guaranteed delivery within 6½ months, as compared with nine months. The English tenders since their receipt had gone up 7½ per cent., owing to increases of wages, but the Swiss tender was settled at one figure. Mr. Varley said the York Corporation inquired into the conditions of labour and wages in Switzerland, and found they were quite satisfactory to the trade unions of that country. Mr. Waring said that the idea of giving work to a foreign firm infringed on a principle that he was anxious to see maintained. Before work was sent abroad every effort should be made to get an English firm to do it. He moved that the matter be taken back for further consideration. Mr. Tinker, who seconded, said that if they accepted a foreign contract in this matter it was admitting a principle that could be applied to anything they had to purchase. Mr. McCormick said he was at the committee meeting when the matter was gone into very carefully, and if they gave the work to a British firm it would cost 27½ per cent. more. At first he took the same attitude as the movers of the amendment, but on reflection he felt he could not justify his position with the ratepayers of St. Helens if he spent the extra money in order to keep the work in England. Alderman Bates said the Committee appreciated that it was a very serious matter for the workers and manufacturers of this country, but they could not waste £5,000. The amendment was defeated by 16 votes to seven.

FORTHCOMING EVENTS.

Royal Institution of Great Britain.—Monday, December 1st. At Albemarle Street, Piccadilly. At 5 p.m. General meeting.

Institution of Electrical Engineers (Western Centre).—Monday, December 1st. At the Merchant Venturers' Technical College, Bristol. At 7 p.m. Address by Mr. W. A. Chamen.

(North-Western Centre).—Tuesday, December 2nd. At the Engineers' Club, Manchester. At 7 p.m. Discussion on "Electricity Supply."

(South-Midland Centre).—Wednesday, December 3rd. At the University, Birmingham. At 7 p.m. Lecture on "Dielectrics," by Mr. G. L. Addenbrooke.

(Students' Session).—Friday, December 5th. At the City and Guilds Technical College, Leonard Street, Finsbury, E.C. At 7 p.m. Paper on "Thermionic Magnifiers," by Mr. H. M. Barlow.

Industrial League and Council.—Tuesday, December 2nd. At the Council Chamber, Guildhall, E.C. At 2.30 p.m. Address on "Government Control and Industry," by the Rt. Hon. Lord Emmott.

Tuesday, December 2nd. At the Y.M.C.A., Tottenham Court Road, W. At 7.30 p.m. Lecture on "Co-operative Production," by Mr. T. Owen Jacobsen.

Wednesday, December 3rd. At the Institute of Journalists, Tudor Street, E.C. At 5.30 p.m. Conference on "Scientific Management."

Society of Technical Engineers.—Tuesday, December 2nd. At the Central Hall, Westminster. Address by Mr. C. H. Wordingham.

(Newcastle Branch).—Wednesday, December 3rd. At the County Hotel. At 7.30 p.m. Discussion on "The Third Party Policy."

Batti Wallahs' Society.—Wednesday, December 3rd. At the Cannon Street Hotel. Smoking concert.

Liverpool Engineering Society.—Wednesday, December 3rd. At the Royal Institution, Colquitt Street. At 8 p.m. Paper on "Marine Propelling Shafting, Bearings and Supports," by Mr. J. Watson.

Junior Institution of Engineers.—Friday, December 5th. At 39, Victoria Street, S.W. At 7.30 p.m. Paper on "Some Notes on E.H.T. Switchgear," by Mr. E. F. Hetherington.

(Midland Section).—Tuesday, December 2nd. At 8 p.m. At the University, Birmingham. Inaugural address by the President, Prof. F. W. Burstall, on "The Professional Status of the Engineer."

Technical Inspection Association.—Friday, December 5th. At the Society of Arts, John Street, Adelphi, W.C. At 7.30 p.m. Paper on "Inspection and Testing of Materials," by Messrs. R. D. Summerfield and H. J. Davey.

NOTES.

Medical Research.—With a Government grant of £50,000 per annum, the Medical Research Committee is doing much good work, and the report for the year ended September 30th last shows that many medical problems, including industrial fatigue, are being investigated. As a result of studies of photosynthesis, it has been found that the so-called active ozone of fresh country air is not ozone, but nitrogen peroxide, and methods have been devised for its safe use as a preventive of common infections. Radio-therapy is being investigated at the Middlesex Hospital with a quantity of radium 10 times as great as any amount previously available for similar work. It is only a few grammes which the Ministry of Munitions collected from gun sights and other instruments of war, but a lead safe, weighing 1·5 tons, has been made to contain it.

Coal Supplies and Prices.—A deputation of representatives of the Institution of Electrical Engineers, the Incorporated Municipal Electrical Association, London electrical supply companies, Provincial Electricity Supply Committee of the United Kingdom, Association of Municipal Electrical Engineers of Greater London, and the Diesel Engine Users' Association was received, on October 31st, by Mr. Lee, of the Coal Mines Department. The object of the deputation was to bring the following matters to the notice of Mr. Lee :—(*a*) Quality of coal supplied to electric power stations; (*b*) increase of price per ton at the pit mouth; (*c*) the consequent increase in the cost of electricity, and the necessity for increasing the maximum prices at which it may be sold to the public; (*d*) restrictions on the sale of energy. The views submitted by the deputation were favourably received, and after hearing a statement by Mr. Lee the deputation was satisfied that a substantial improvement in the position would be effected.

The Fuel and Lighting Order.—The Board of Trade announces that the Controller of Coal Mines has suspended those provisions of the Household Fuel and Lighting Order, 1919, which limited the quarterly consumption of users of gas and electricity. The provisions requiring that anthracite, coke, and briquettes should be obtained only from the merchant or dealer with whom the consumer is registered have also been suspended.

Electric Lamp Renewals.—The statutory meeting of the Aladdin Renew Electric Lamp Corporation, Ltd., was held at the Cannon Street Hotel, on the 20th inst., Sir Harry Foster, J.P., D.L., chairman of the corporation, presiding. The secretary having read the notice convening the meeting and the certificate of the auditors, the chairman said that there were no resolutions to submit. The company, with a nominal capital of £200,000, was formed to acquire the assets and business of the Renew Electric Lamp Co., Ltd., of Harrow Road. The assets included the world rights of the invention of Mr. F. Harrison, and others for permitting the repair or renewal of a broken filament in an electric lamp bulb, while retaining the other parts of the lamp in use. The capacity of the Harrow Road works had been trebled, and it was hoped to have another factory running at Birmingham in the new year. Later it was intended to extend operations to Manchester, Bristol, and Glasgow, either by establishing factories or licensing local companies. It was possible to supply renewed lamps to consumers at a substantial reduction on the present price of new lamps. The renewed lamps had been submitted to independent trials, side by side with the best new lamps by Messrs. Kynoch, Ltd., of Birmingham, and at Faraday House, London. The average life of the renewed lamps was found to be 60 per cent. higher, and the current consumption per C.P. was 24·8 per cent. less than new lamps. The rights for New Zealand had been sold, and options granted in respect of France, Switzerland, India, Canada, and Australia. Messrs. Pathé Frères applied for and obtained permission to take a film of the process of renewal of the lamps for exhibition as a public utility, and the film had already been shown in London and the provinces. It was thought that a demonstration would be of interest to the shareholders, and at the conclusion of the meeting the film was shown. Mr. Harrison, the inventor, whose services as technical adviser have been retained by the company, explained the process step by step, and pointed out its simplicity and cleanliness. He said that all the work was done by female labour by piecework with satisfactory results. The pip on bulb was first removed, and a small hole made through which all subsequent operations were carried out. The tools used were few in number and quite inexpensive.

U.S.S. "California."—News from Valledo, California, states that the electrically-driven super-Dreadnought *California* was considerably damaged while being launched at Mare Island Navy Yard. The brakes failed to hold the vessel as she slid down the ways; the ship crossed the narrow channel, and collided with the pier on the opposite side.

The A.I.E.E. Publication Policy.—Through its board of directors, the American Institute of Electrical Engineers has made a radical change in its policy respecting the publications it issues. Heretofore the monthly *Proceedings* and the annual *Transactions* have been issued at considerable expense out of the general funds of the Institute. Among the recommendations made a few months ago by the Development Committee, which made an investigation of Institute affairs, was that a policy be adopted which would make the Institute's publications, especially its monthly, of more value to the members, and yet self-sustaining. A similar problem was presented to the American Society of Mechanical Engineers a year or so ago, and it was solved by greatly expanding its monthly *Journal*, the expense being met by taking on a great deal more advertising than before. In view of the evident success of this sister Society's changed publication policy, the A.I.E.E. has followed the precedent. According to the *Electrical Review*, of Chicago, this action comes after considerable discussion and protest by a number of members against a national technical society falling back upon commercial support to relieve the membership from sharing equitably in meeting the increased cost of operation. Similar protest was made in the A.S.M.E. against thus lowering the Society's ethics.

Ramsay Memorial Fund.—Prof. Arrhenius, the Swedish chemist, strongly advocates that Sweden should contribute to the Ramsay Memorial Fund and send a Fellow to England for research work.—*The Times.*

Tungsten Lamp Litigation.—Judge Mayer, in the United States District Court, has held, in the case of the General Electric Co. *v.* Nitro-Tungsten Lamp Co., that the defendant has infringed the Langmuir lamp patent in so far as it relates to the specific claims of a tungsten filament under pressure in a gas. The more general claims were not passed on, although intended to mean the same, because they might be capable of expansion.—*Electrical World.*

New York Printers' Strike Benefits Chicago.—According to the *Electrical World Bulletin*, an unusual increase was noted in the demand for direct current service in Chicago during October. The cause was thought to be extra printing business resulting from the printers' strike in New York. The Commonwealth Edison Co. was making an investigation.

Electric Welding.—About 200 people attended the first regular meeting of the American Welding Society, which was held on October 24th, when, in addition to other papers, Prof. R. G. Hudson presented what was declared by President Comfort A. Adams to be the first rational theory of metallic arc welding.—*Electrical World.*

Municipal Secrecy.—Embarrassed by the publication of financial details, Acton Council will not admit reporters to Committee meetings.—*The Times.*

Educational.—Mr. John T. Cargill, of the Burma Oil Co., has offered £20,000 to Glasgow University for the foundation of a Chair of Applied Physics.

Electric Winding Gear.—Some time ago a comparison was made in the *Revue Générale de l'Electricité* of the operation of winding gear by the Leonard system and by direct three-phase motor, the conclusion being reached that the former was indisputably the superior method. It is now argued that such improvements have been made in the use of three-phase motors that this method is really superior as regards energy consumption. The comparison is made having regard to simplicity of operation, reliability, shocks to the generating plant, and economy in running.

An Electric Marking Machine.—Apparatus described in the *A.E.G. Mitteilungen* is intended to replace punches for marking machine parts with reference numbers. According to the *Technical Review*, it consists of a 1-KW. transformer with a secondary voltage of 1·5 volts. One pole is connected to a metal table, upon which the part to be marked is laid, and the other is connected to a flexible lead to which a copper point is attached. This point is used like a pen, either free-hand or with the aid of stencils. In its passage over the surface of the part, the heat generated melts the metal, and a permanent marking is produced.

Electricians' Strike.—Demanding reinstatement of four members given notice by a local colliery, electricians of the North Staffs. branch of the E.T.U. struck work on the 25th inst. According to the daily Press, the colliery authorities state that they are dispensing with the men's services simply because they are reducing their staff.

Trade Unions' Amalgamation.—Details of the engineering trade ballot on the proposed amalgamation of Unions were announced by the daily Press on Wednesday, as follows:—Total number of ballot papers issued, 527,640; total number returned, 282,582; votes in favour of the scheme, 239 645; against, 42,665. Eight societies secured the number of votes required by law, and seven failed; the Toolmakers by 5 per cent., and the E.T.U. by 2½ per cent.

Electrical Development.—The activities of the Electrical Development Association are rapidly growing more extended and diversified. Amongst recent publications are notes relating to the supply of electricity to the working-class house (new model), and to the comparative merits of gas and electricity as regards economy of fuel; this week we have received a handsome brochure, entitled "Light in the Home," with illustrations showing how electric lamps should be used to the best advantage, and useful hints as to the methods to be followed to ensure good lighting without glare; another pamphlet deals with electric service in the household, and a number of leaflets present correct ideas on the benefits of electricity in an attractive way. Copies can be obtained from the director, Mr. J. W. Beauchamp.

Whitley Councils.—A meeting of the District Council for Electricity Supply (No. 6, Western Area) was held at the Employment Exchange, Victoria Street, Bristol, on Monday, November 17th, Mr. H Faraday Proctor in the chair. A Sub-Committee was appointed of four members on the employers' side and four on the employés' side to obtain information and to report to the Council on the question of the consolidation of war advances and war bonuses into permanent rates of wages, and on conditions of labour. A resolution was passed recommending the National Council for Electricity Supply to issue a notice to all electricity supply undertakings that the Engineering Award dated Nov. 5th, 1919, of 5s. per week be paid, except in cases where it has been the practice to regulate the wages of the men concerned by other awards. A resolution was also passed recommending those undertakings which had not already done so to adopt the 47 and 48 hours' working week.

About a Peterborough Vacancy.—A correspondent states that the Peterborough T.C. received only two applications for the post of shift engineer at the electricity works. One was unable to carry out repairs to the plant, which is part of the duties, and the other was not willing to accept the appointment unless the corporation secured a house for him. Neither was appointed.

Scientific Research.—Applications for the Government grant for scientific investigations for the year 1920 should be received at the offices of the Royal Society not later than January 1st next.

Inquiries.—Makers of the "Fernier Superheat Temperature Gauge," Wood's solder for heat-coil fuses, and electric standards of carved wood are asked for.

Ex-British Westinghouse Association.—The second annual re-union dinner will take place in the Holborn Restaurant on Friday, January 23rd, at 7 p.m. Invitations to members are shortly being issued. Inquiries should be addressed to the Hon. Secretary, Mr. L. S. Richardson, 14, Sydney Road, Richmond, Surrey.

Silver Coinage.—The *Financial Times* states that Sir Henry Haward, Comptroller of the London County Council, and Mr. A. L. C. Fell, general manager of the Tramways Department, have been authorised by the Council to give evidence before a Departmental Committee on Silver Coinage on condition that such evidence is limited strictly to facts.

Institution and Lecture Notes.—Institution of Electrical Engineers.—The opening meeting of the North-Western Centre was held on Tuesday, November 18th, at the Engineers' Club, Manchester. Mr. A. P. M. Fleming, in introducing the new president, Mr. J. A. Robertson (Salford Borough electrical engineer), referred to the fact that that gentleman six years ago was the president of the Scottish Section, and represented it on the council. In the present state of the electrical industry it was desirable that power-station men should be in charge of affairs, and the business experience, training, and capacity of Mr. Robertson made it certain that they were in very good hands. Mr. Robertson delivered his presidential address, and a vote of thanks was moved by Alderman Walker, seconded by Mr. Pearce, and carried unanimously.

Society of Technical Engineers.—The Society of Technical Engineers will inaugurate its winter campaign with a mass meeting to be held in the Central Hall, Westminster, on December 2nd, at 7 p.m., when Mr. C. H. Wordingham, past-president of the Institution of Electrical Engineers, will speak. The Society was formed early in 1918; its rules have now been submitted to the Registrar for approval in order that the society may be formally registered as a trade union. Members of the society comprise the great middle class between Capital and Labour in all branches of engineering—men in the technical, managerial, and administrative grades without whose brains the engineering industry could not continue, whose interests are commonly overlooked in industrial disputes, and who, it is felt, should have a voice in any National Industrial Council that may be set up for the engineering industry. Though the membership of the society is open only to qualified men who are not engaged in purely manual work, it does not exclude scientifically trained pupils temporarily engaged in works, nor men who do not possess degrees in engineering, because it is realised that in all branches of the profession men are to be found who, though having no recognised theoretical training, are nevertheless doing valuable work in an administrative or technical capacity. It is contemplated, however, to raise the qualifications for admission gradually so that membership of the society will ultimately become a guarantee of professional standing. During the past year the membership of the society has continued steadily to expand. Branches have been formed in many towns throughout the Kingdom, and the members are in process of being grouped into sections according to the department of engineering which they profess. Friendly relations have been established between the society and one or two existing sectional societies previously formed for the purpose of protecting the interests of engineers engaged in the particular branch of engineering concerned. The constitution of the society is such that it will be easy for such sectional societies to establish very close relations with the society, becoming in fact actual sub-sectional groups within the main section of the society without necessarily losing their identity or power of self-government, subject to the possible subordination of the interests of a group to those of the profession as a whole. Federal relations with other societies for other industries having similar objects are in process of arrangement. Engineers and others engaged in administrative and similar capacities in any branch of engineering are invited to attend the above meeting or to communicate with the general secretary at 102, Belgrave Road, London, S.W. 1.

National Electric Light Association, U.S.A.—The 1920 Convention will be held at Pasadena, California, from May 18th to 21st. The N.E.L.A. *Bulletin* being held up by the printers' strike in New York City, communication with the members is being maintained by means of a leaflet.

Illuminating Engineering Society.—On Tuesday, Mr. L. C. Martin gave a demonstration of an invention for enabling colours to be matched with artificial light, as in daylight.

Physical Society of London.—At the meeting held on November 14th, a paper "On the Self-inductance of Single-layer Flat Coils," was read by Mr. S. Butterworth. In the discussion, Dr. Eccles recalled the very useful paper published by the author some years ago, giving formulæ for thick coils. He had found these extremely useful. Dr. E. H. Rayner said that with formulæ such as these it was possible with the simplest appliances to construct an inductance to within 1 per cent. of the required value. Prof. G. W. O. Howe pointed out that J. Spielrein had developed similar formulæ.

A paper entitled "An Experimental Method of Determining the Primary Current at Break in a Magneto" was read by Dr. N. W. McLachlan. A condenser is connected across the secondary winding to reduce the voltage below that required to cause sparking at the safety gap. The peak voltage due solely to interruption of the current at any speed is found. The interrupted direct current necessary to give the same peak voltage is also found by using a calibrating circuit. The magnitude of this current is equal to that broken in the magneto. The influence of the secondary condenser on the primary current at high speeds is discussed. In the discussion Dr. Norman Campbell stated that it was possible to make satisfactory measurements on the primary current of a magneto by inserting in the circuit a small non-inductive resistance and taking the potential difference across it by means of a rotating "contactor." The total resistance inserted need only be 0.03 ohm.; 0.01 for the leads, and 0.02 for the measuring resistance. By the use of a suitable potentiometer method a change of 0.02 amp. could then be detected, which was ample for practical purposes.

A new form of Wehnelt interrupter was exhibited by Mr. Newman. A plate of aluminium, area 50 sq. cm., took the place of the lead plate, the other electrode being platinum wire sealed in a glass tube. These electrodes were immersed in a saturated solution of ammonium phosphate made alkaline with ammonia. This interrupter worked equally well with direct or alternating currents. In the former case the wire must be made the positive electrode. The cell worked with a minimum potential difference of 18 volts, but the frequency of the interruptions increased with the applied potential difference.

Modern Illumination.—Mr. L. Griffiths read an interesting paper, under the members' prize scheme of the Coventry Engineering Society at the Technical Institute, on November 28th, on the above subject. He pointed out that during the war great attention was called to lighting, and demonstrated the value respectively of carbon, metallised carbon, drawn wire, and half-watt lamps, and the results obtained from various kinds of reflectors. He gave formula showing the effectiveness of the types of illuminating devices and the systems adopted to overcome glare and shadow. He claimed that by efficient lighting an increased output of work could be obtained, that the quality of the work was increased, and a greater degree of health and comfort for the workers ensured at an economic cost. In the discussion that followed it was claimed that the metallic lamp gave specially good results in moulding shops as its penetrative power was helpful in detecting flaws in the castings. Attention was also called to the proper type and adjustment of reflectors, it being mentioned that in one workshop there was a large half-watt lamp with a ridiculously small opal shade and consequently a great waste of light. The lecture was illustrated with lantern slides.

Electricity Supply.—Under the auspices of the Yorkshire Section of the Textile Institute a lecture was delivered at Batley, last Monday, on "Electricity Supply," by Mr. W. B. Woodhouse, engineer and manager of the Yorks. Electric Power Co.

The British Association.—As is well known the fund of this Association, after office expenses are paid, is devoted to scientific research. At the recent Bournemouth meeting the general treasurer announced that a prominent member, whose name he did not wish to mention for the present, had offered to start a fund with a donation of £1,000. The importance of research work need not be dwelt upon; in the two days following the announcement the fund was raised to a total of £1,475. The Association intends to publish in due course a list of names of donors and donations. Further particulars may be had on application to Prof. J. Perry, at Burlington House, Piccadilly, W.1.

A Newcastle Dance for the E.T.B.I.—For several years the Newcastle Electrical Contractors' Association has held an annual dinner to which others in the district interested in electrical affairs have been invited. This year a much more ambitious function is being organised. It has been decided to hold a reception, conversazione, supper and dance, under the auspices of the Electrical Trades' Benevolent Institution on December 12th at Tilley's Rooms, Market Street, Newcastle-on-Tyne, at 7.30 p.m. A committee representing the N.E. Coast contractors, electric supply, and tramway authorities, factors, and manufacturers has been formed to carry out the scheme. The prices are 30s. for a double ticket and 21s. for a single ticket. The chairman of the Benevolent Institution has consented to be present, and Mr. and Mrs. R. P. Sloan will act as host and hostess. It is hoped that it will be possible to hand over a substantial sum to the Electrical Trades Benevolent Fund. Tickets may be obtained from members of the committee, or from the hon. secretary, Mr. W. Fletcher, 65, Blackett Street, Newcastle-on-Tyne.

Appointments Vacant.—Charge engineer (£215) for the Barnsley Corporation Electricity Department; telegraph inspectors (£250 + £120) for the Gold Coast Government Telegraphs; telegraph mechanician (£250 + £120) for the Nigeria Government Telegraph Department. See our advertisement pages to-day.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station and Tramway Officials.—Rotherham T.C. has increased the salary of Mr. H. Baker, chief clerk in the electric light department, to £250 per annum; and that of Mr. W. G. Marks, tramway traffic superintendent, to £300 a year.

Dover T.C. has increased the salary of the tramway manager (Mr. Bond) to £375 a year, the advance of £50 to be war bonus, and to date from October 1st.

Mr. J. Savage, electrical superintendent in the Paisley Corporation electricity department, has been promoted to station superintendent.

We are informed that Mr. Makin, formerly chief assistant, has been appointed electrical engineer and general manager to the Bexley U.D.C. at a salary of £700 per annum.

General.—Fulham B.C. Electricity Committee has appointed Councillor J. HAYMAN chairman, and Councillor J. C. WADMAN, vice-chairman for the ensuing year.

Indian Engineering states that Mr. F. E. BULL, lately chief engineer, Public Works Department, Assam, will on return from leave in November be appointed chief engineer of the hydro-electric survey in place of the late Mr. G. T. Barlow, under the direction of the chief engineer, Punjab Roads and Buildings Branch. Lieut.-Col. Battye, R.E., D.S.O., has been placed on special duty to examine and report on the possibility of a hydro-electric scheme on the Sutlej river in the neighbourhood of the projected Bhakra Dam where from 80,000 to 150,000 H.P. can probably be developed at a reasonable cost. Mr. C. Lawton, chief electrician of the Government telephone service, recently visited Rangoon in connection with the recently inaugurated system of Government telephones in Rangoon, and with the proposals before the Government of India to acquire the service of the Oriental Telephone & Electric Co., Ltd., both in Burma and India.

Professor J. C. MCLENNAN, F.R.S., is about to return to Toronto to resume his duties as Professor of Physics at the University. His services were lent to the British Admiralty in 1917, and he has latterly been acting as scientific adviser to the Board of Admiralty.

The American *Electrical Review* states that Mr. F. GILL has been appointed chief engineer of the Western Electric Co. for Europe, "adding to the staff of this company one of the best-known and highly respected telephone engineers outside the United States." Our contemporary says: "With the outbreak of war, he offered his services and was called upon at an early date to organise a department of the Ministry of Munitions which he undertook in a voluntary capacity. At the completion of his work he resumed his consulting practice. The exigencies of war called for his further service in this direction, and he was asked to establish and take charge of another department which occupied his time from 1917 until he relinquished the office of controller of stores in the Ministry of Munitions last June to enter the services of the Western Electric Co."

Mr. W. H. TAYLOR, A.M.I.E.E., A.A.I.E.E., previously electrical superintendent to the Western Australian Government, and responsible for their electricity supply scheme, has been appointed general manager, combining the Government tramways and electricity supply scheme.

Mr. D. M. WATSON, B.Sc., A.M.Inst.C.E., has entered into partnership with Messrs. Dodd & Dodd, M.M.Inst.C.E., civil and consulting engineers, of County Chambers, Corporation Street, Birmingham. The name of the new firm is Dodd, Dodd & Watson.

Lieutenant J. E. CHAMBERLAIN, City of Edinburgh Fortress Engineers (Electric Light Company), has relinquished the acting rank of captain on ceasing to command a company.

Roll of Honour.—Sapper O. W. SLATER, who had been in the R.E. since the outbreak of war (after 15 years' service at the Brighton Corporation Electricity Works), has died in hospital after meeting with an accident.

Obituary.—MR. T. HUMPHREYS.—Mr. Thomas Humphreys, electrical engineer to Messrs. Fothergill & Harvey, Ltd., passed away at Littleborough last week, aged 54 years. It is stated that Mr. Humphreys put in the first electric light installations in Rochdale at the Market Co.'s premises and at the mill of Messrs. John Bright & Bros., before the Corporation had its own electrical undertaking. He then became manager for the Rochdale Electric Co., holding that position for about 20 years, but just before the outbreak of war he went to Messrs. Fothergill & Harvey. He was an A.M.I.E.E.

MR. W. D. WEAVER.—We regret to learn from the *Electrical World Bulletin* for November 8th that Mr. William D. Weaver, a former editor of that journal, passed away suddenly on November 1st, at his home at Charlottesville, Va. He was 62 years of age.

NEW COMPANIES REGISTERED.

Pearl Pictorial (Foreign and Colonial), Ltd. (160,691).—Private company. Registered November 17th. Capital, £10,000 in 6,000 10 per cent. cumulative preference shares of £1 each and 80,000 deferred shares of 1s. each. To acquire, develop and/or dispose of the whole or any part of the patent rights, trade marks and secret processes in any part of the world (except the U.K.) of an invention for improvements in motion illuminated advertising devices, and to enter into an agreement with E. C. Leachman (vendor), T. Holden and S. Spitzel. The subscribers (each with one preference share) are: T. Holden, 64, Bishops Mansions, S.W., solicitor; T. L. Meredith, 31, Grove Avenue, Church End, Finchley, N.3, insurance manager. The first directors are: E. C. Leachman (managing director) and others to be appointed by the subscribers. Secretary: R. C. Haddon. Registered office: 11, Ironmonger Lane, E.C.

Cray Installations, Ltd. (160,596).—Private company. Registered November 14th. Capital, £15,000 in £1 shares. To carry on the business of electrical and mechanical engineers and contractors, manufacturers of agricultural implements and other machinery, &c. The subscribers (each with one share) are: E. H. Joynson, Easthill, Bickley, Kent, paper manufacturer; C. H. Beadle, The Lodge, Winn Road, Southampton, engineer; J. Young, 10, Westwood Road, Southampton, electrical engineer; D. H. W. Alexander, The Old Mansion, Boldre, Hants, engineer. First directors: E. H. Joynson, C. H. Beadle, J. Young and D. H. W. Alexander. Qualification, £500. Solicitor: A. W. Pearce, 6, St. Michael Street, Southampton. Registered office: South Factory, Sugar House Lane, Lower High Street, Southampton.

Marine and Mechanical Electric Welding Co., Ltd. (160,559).—Private company. Registered November 13th. Capital, £10,000 in £1 shares. To carry on the business of electric arc and oxy-acetylene cutting and welding of metals and alloys, engineers, pattern and boiler makers, &c. The subscribers (each with one share) are: J. W. Snodgrass, 58, West Regent Street, Glasgow, solicitor; Marjorie Brown, 58, West Regent Street, Glasgow, clerk. The first directors are: J. M. Gilchrist, Aytoun, Sydenham Road, Downhill, Glasgow; T. Ballantine, 34, Queen's Gate, Downhill; A. Woodward, 6, Palmerston Road, East Sheen, S.W.; and W. Pollock, 3, Lloyd's Avenue, E.C. Qualification, £100. Registered office: 3, Lloyd's Avenue, E.C.

George McGhee & Co., Ltd. (10,747).—Private company. Registered in Edinburgh, November 13th. Capital, £2,000 in £1 shares. Objects: To take over the business carried on by George McGhee as "George McGhee & Co.," at 30, Easterhill Street, Tollcross, Glasgow, as mechanical and electrical engineers, gas engine makers, &c. Agreement with G. McGhee. The subscribers (each with one share) are: G. McGhee, 30, Easterhill Street, Tollcross, Glasgow, engineer; J. Soye, 475, Gallowgate, Glasgow, electrical engineer. The first directors are: G. McGhee, J. Soye and R. Soye, Home Farm, Lurgan, Ireland, farmer. Registered office: 30, Easterhill Street, Glasgow.

Electric Fabrics, Ltd. (160,709).—Private company. Registered November 18th. Capital, £3,000 in £1 shares. Objects: To acquire a patent granted to C. S. Davidson for the heating by electricity of sheets, rugs, mattresses, foot warmers and the like, &c., and to enter into an agreement with C. S. Davidson, H. Hawkins and F. J. Hawkins. The subscribers (each with one share) are: H. Hawkins, 125-128, London Road, S.E.1, ironmonger; F. J. Hawkins, 125-128, London Road, S.E.1, ironmonger. The first directors are: C. S. Davidson, 33, Vicarage Road, East Sheen, S.W.1; H. Hawkins, and F. J. Hawkins. Registered office: 128, London Road, S.E.1.

F. W. Cook & Co. (Southampton), Ltd. (160,675).—Private company. Registered November 17th. Capital, £10,000 in £1 shares. To take over the business of an electrical engineer, plumber and gas and hot-water engineer, carried on by F. W. Cook at 23 and 24, Bargate Street, Southampton, as "F. W. Cook & Co." The subscribers (each with one share) are: E. A. Smith, 31, Oakley Road, Shirley, Southampton, plumber; W. J. Small, 120, Malmesbury Road, Southampton, electrical engineer. The first directors are: F. W. Cook (permanent managing director and chairman), E. A. Smith, R. H. Burkett, F. B. While and W. Small. Qualification, £100. Registered office: 23-4, Bargate Street, Southampton.

Electrical Specialities Co., Ltd. (160,673).—Private company. Registered November 17th. Capital, £3,000 in £1 shares (1,000 preference). Objects: To carry on business as indicated by the title. The subscribers (each with one share) are: A. Wood, 53, Brunswick Street, Sheffield, electrical engineer; W. Levick, Dronfield Woodhouse, near Sheffield, managing clerk. The first directors are to be appointed by the subscribers. Qualification, £100. Registered office: 33, King Chambers, Angel Street, Sheffield.

Midland Farm Service Co., Ltd. (160,561).—Private company. Registered November 13th. Capital, £30,225 in 30,000 ordinary shares of £7 each and 4,500 deferred shares of 1s. each. To acquire a sole licence under the Wolfryn patents for the electrification of seeds in the counties of Leicester, Warwick and Worcester and elsewhere, &c. The subscribers (each with one ordinary share) are: J. J. H. Sturmey, The Quarry Close, Coventry, engineer; T. A. Bury, 2, Radford Fields, Coventry, company's secretary. Directors: H. Sturmey (managing director) and J. Hewitt. Registered office: 2, Radford Villas, Coventry.

Northern Ball Bearings, Ltd. (160,618).—Registered November 14th. Capital, £200,000 in £1 shares. To carry on the business of sellers and manufacturers of ball and other bearings, engineers, contractors, &c. The first directors are: N. C. J. L. Wallenius, Goteborg, Sweden (director of Johanseen Gauge Co. and other Swedish concerns); L. E. Little, 30, Ederline Avenue, Norbury, S.W.; A. Senior, Forsbacka, Ivy Park Road, Sheffield, chairman, A. Senior & Sons, steel manufacturers; L. H. Coatalen, 30, Ederline Avenue, Norbury, S.W., chief engineer, Sunbeam Co.; A. G. Scammell, Innisfallen, Marlborough Road, Luton (director of G. Scammell & Nephew, Ltd.); J. B. Tainton, 22, Marloes Road, W.8, managing director, Tainton Cars, Ltd.; J. Beswick, 48, Park Road, St. Annes-on-Sea. H. O. J. L. Wallenius is Swedish and L. H. Coatalen is French. Remuneration, £100 each per annum. The directors may not grant licences, sell or dispose of any of the company's patents, or purchase or sell freehold or leasehold property without the consent of a general meeting. Solicitors: Munns & Longden, 4b, Fredericks Place, Old Jewry, E.C. Registered office: 115, Great Portland Street, W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Telephone Manufacturing Co., Ltd.—Debentures for £20,000, registered October 14th, 1919, charged on the company's undertaking and property, present and future, including uncalled capital.

Splitdorf Electrical Co. of London, Ltd.—Debentures for £15,000, registered October 11th, 1919, charged on the company's undertaking and property, present and future, including uncalled capital.

T. P. Pollitt & Co., Ltd.—Debentures for £1,500, registered September 17th, 1919, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. C. Smethurst, Wootton Grove, Ulcely, Lincs.

Dowsing Radiant Heat Co., Ltd.—Satisfaction registered October 13th, 1919, of all moneys due or to become due, registered September 17th, 1918.

Phœnix Dynamo Manufacturing Co., Ltd.—Satisfaction registered October 14th, 1919, of £15,000 registered August 15th, 1903, and £2,500 registered February 27th, 1906.

Pirelli-General Cable Works, Ltd.—Satisfaction registered October 8th, 1919, of charge for £50,000 registered June, 1916.

Yorkshire Electric Wiring & Motor Co., Ltd.—Satisfaction registered October 25th, 1919, of all moneys due under charge registered May 24th, 1918.

Electric Supply Co. of Victoria, Ltd. (66,059).—Return dated October 30th, 1919. Capital, £325,000 in 175,000 preference and 150,000 ordinary shares of £1 each. 175,000 preference and 125,000 ordinary taken up. £50,000 paid. £249,993 considered as paid. Mortgages and charges, £126,790.

Rural Electricity Supply Co., Ltd. (107,281).—Return dated August 29th, 1919. Capital, £10,000 in 9,500 preference shares of £1 each and 10,000 deferred shares of 1s. each. 5,492 preference and 5,713 ordinary shares taken up. 2,851 preference and 5,713 deferred shares fully paid up in cash. 2,641 preference credited as fully paid. Mortgages and charges, nil.

CITY NOTES.

Drake & Gorham, Ltd.

Addressing the annual meeting of this company on November 18th, Mr. Bernard Drake, the chairman, said that the balance sheet showed results greatly exceeding those of any year since the formation of the company. Last year they congratulated themselves on a profit of £18,781, which they had been able to increase to £27,136, though this was subject to a large deduction for excess profits duty. In his opinion the Excess Profits Tax should have been abolished as soon as they were able to turn attention to peace requirements and the rebuilding of shattered trade. It surely was a mistake to restrict turnover to the 1914 standard, for this was the effect of the tax, besides which it encouraged extravagance. Previous to the war the British electrical industry was dominated by Germany, and therefore paid inadequate dividends, so that it was specially hard hit by this method of taxation just when a chance of expansion occurred. In a letter to the *Times* he had stated that anything which was hindering production should be abolished without delay, and that no tax should be imposed until 10 per cent. had been distributed. In addition to country-house lighting they had been busy on industrial work, and they had secured the services of Mr. Holbrook Gaskell, O.B.E., M.I.E.E., &c., until recently chief engineer of the United Alkali Co., in which capacity he had been responsible for the electrical equipment of their various works at home and abroad on a large scale. The 10,000-KW. generating station they had been equipping was not yet completed owing to builders' strikes. They had had a considerable staff of men engaged at Palmer's Shipbuilding & Iron Co., both on power work in the shipyard and also on lighting, as well as the equipment of new vessels for the Admiralty and the mercantile marine. Industrial work had also been carried out for Messrs. Brunner Mond, Stone & Co., Uxbridge Gas Co., and many others, and they had been engaged throughout the year on important work for the Admiralty. They had also undertaken contracts for the Salford Rolling Mills, the Gibraltar Mill and the Grecian Mills, and for Messrs. S. Fox & Co., of Sheffield; also lighting and power for a number of other factories such as Electro-Bleach and By-products, Ltd., and Naylor, Jennings & Co. In addition to these they were engaged on electric-driving schemes for the Dacca Twist Co. and others. The cotton-mill driving equipment of 1,000 KW. which they erected several years ago continued to work satisfactorily. They had been fully occupied in meeting the arrears of country-house lighting which had accumulated during the war, and the advent of the small self-contained generating sets, which could be started by merely closing a circuit and left to stop themselves when the battery was full, had brought electric lighting within the range of many who could not previously afford to make use of electricity for lighting and labour-saving apparatus in their homes. They had opened an office in Belfast for the purpose of running a number of important sole agencies for Ireland, such as Callender's Cable & Construction Co., Crompton & Co., George Ellison, Bates & Scholes, Ltd., and Harry W. Cox & Co., and negotiations were in progress for others. The branch would be run solely as an agency business, and contracting work would be transferred to contractors. The works had been busy throughout the year, and showed a large increase in profit. A considerable number of commercial accumulator-driven electric vehicles had been supplied, and valuable experience had been gained with various types of chassis. Up to the present the company had restricted its operations to Lancashire and Cheshire, but arrangements were now being made for supplying these vehicles wherever required. There was a considerable demand by municipalities for refuse collection, in which large economy had been shown over horse traction, as well as for brewers' requirements and all short-range delivery purposes. The main difficulty at present was to provide the vehicles fast enough to meet the orders received. Trucks for handling luggage at railway stations and goods in factories had proved their worth, and their use was rapidly extending. They found it advisable to separate the wholesale department entirely by transferring the business to another company—Drake & Gorham Wholesale, Ltd. The rapid increase in turnover might necessitate the consideration of raising fresh capital before long. It has become necessary to find fresh accommodation for the head offices, and they had purchased a long lease of 36, Grosvenor Gardens. The necessary alterations were in hand.

Amazon Telegraph Co., Ltd.

At the annual meeting held last week the chairman said that considering the abnormal times through which they had been passing the outcome of the year's working was satisfactory. The rubber crop again showed a falling off—in fact it was the smallest since 1903-4. The record nut crop and the good cocoa crop had largely helped to maintain their traffic receipts during the period of depressed trade conditions on the Amazon. The traffic receipts increased by £2,107; both ordinary, international, and local traffic increased, but the local deferred service appeared to have reached its limit, at any rate for the time being. The gross revenue was £2,582 (3 per cent.) better than in the preceding year. The cost of maintaining the cables was £14,943, against £12,476 for the previous year, chiefly due to the fact that the *Viking* was due for her special survey during the year. As she had to be sent down to Para for docking she repaired some interrupted cable sections on the way down. She was in commission about 5½ weeks, during which time the s.s. *Ramos* was laid up. Cable used for repairs absorbed £2,542, an increase of only £693 over the previous year; but, owing to the higher price they now had to pay for new cable, the charge under this heading would tend to increase in future. Breaks in the cables had been less numerous and through communication between Para and Manaos had been maintained throughout the whole year. The most frequent causes of interruptions to their cables were corrosion and landslips. The latter accounted for 11 breaks during the year. They had lately been able to ship 50 miles of cable, which had now safely arrived on the Amazon; but the cost delivered there was nearly three times what it was as compared with pre-war prices. With regard to the prospects for the current year the traffic receipts up to the present were between £2,000 and £3,000 up. The price of fine hard Para rubber still remained at a low figure, namely, about 2s. 6d. per lb., and until some rise in price took place, or the rate of exchange fell, there could not be any revival in the wild rubber trade on the Amazon. Experiments were being conducted about 100 miles below Manaos in cultivating rubber. The chief difficulty of the wild rubber collectors is the question of transport. Owing to the fact that practically all the trees near the river banks have been exhausted, they have to go further and further afield, with a consequent great increase in the cost of transport. This prevents them from being able to produce rubber at a profit to compete with the plantation rubber at the low prices to which that sometimes falls. Should this experiment of cultivating rubber on the banks of the Amazon prove successful, which certainly appeared very probable, seeing that the trees would be growing in their native soil, and should the matter be energetically taken up no doubt prosperity would again return to the Amazon rubber industry. Increased attention was being given to the cultivation of cotton, and other trades were developing in a small way, so that they might confidently look forward to at least as good a year as the one just passed through.

Prospectuses.—*Anglo-Portuguese Telephone Co., Ltd.*—This company is offering for subscription an issue of 250,000 ordinary shares of £1 each at par. The purposes for which the new capital is required were briefly indicated in the speech summarised on p. 631 of our issue of November 14th. The entire issue is underwritten. The list is to close on or before Tuesday next.

W. H. Dorman & Co., Ltd.—The prospectus of this company, which will be published on Monday next, will offer for subscription 250,000 cumulative part preference shares (8 per cent.) of £1 each and 50,000 ordinary of £1 each. The company are specialists in internal-combustion engines for petrol or paraffin, and makers of the C.C. interrupter gear and exclusive licensees of the manufacture in the United Kingdom of portable percussion and rotary tools under patents of Mr. George Constantinesco for the wave system for transmission of power through liquids. The list will close on December 4th. No part of the issue has been underwritten.

The A.E.G. Dividend.—The directors of the A.E.G., of Berlin, have issued a statement showing net profits of 27,031,000 marks (pre-war £1,351,550) for 1918-19, as compared with 37,200,000 marks (£1,860,000) in the previous year. The additional expenses for wages and salaries in 1918-19 are reported to have amounted to almost 120,000,000 marks (£6,000,000). As a consequence, and as at the same time, owing to the increased cost of raw materials, the liquid funds have declined, it has been decided to equalise matters by the issue of debentures for 100,000,000 marks (£5,000,000). A dividend is recommended at the rate of 10 per cent. on share capital of 200,000,000 marks (£10,000,000), this contrasting with 14 per cent. on the same amount of capital in 1917-18.

Blackpool, St. Annes & Lytham Tramway Co.—The proposed purchase of this undertaking was agreed to at a meeting of the debenture holders and shareholders on Friday. The St. Annes Council has given notice of its intention to apply to Parliament for a Bill to enable it to purchase the undertaking. The purchase price is to be £140,000. The Council proposes that the section of the line in Lytham be purchased by the Lytham Council and leased to St. Annes, or that the whole line be managed by a joint board.

The Norwegian Nitrogen Co.—The Norsk Hydro-Elektrisk Kvaelstof A.B., whose general meeting was held at Notodden on November 14th, declared a dividend at the rate of 12 per cent. both on the ordinary and preference shares.

Stock Exchange Notices.—Application has been made to the committee to allow the following to be officially quoted:—

Ruston & Hornsby, Ltd.—631,432 ordinary shares of £1 each, fully paid, Nos. 600,001 to 1,231,432.

Tramways, Light & Power Co., Ltd.—£502,100 consolidated ordinary stock; and £354,960 5 per cent. debenture stock.

Blandford (Forum) & District Electric Supply Co., Ltd.—The County of Dorset Electric Supply Co., Ltd., have now parted with their interests in the Blandford Co., and the Blandford Co. is being carried on as an independent company. The offices are now: Electricity Works, Damory Street, Blandford.

Water Softeners, Ltd.—For the year ended June 30th there was a net profit of £8,556, converting a debit balance of £9,720 into a credit of £4,835. A dividend of 2 per cent., free of tax, is being paid.

Petters, Ltd.—Interim dividend at the rate of 5 per cent. per annum, free of tax, on the ordinary shares for the past half-year.

Calcutta Electric Supply Corporation, Ltd.—Units sold to consumers during four weeks ended September 26th were 2,856,681, compared with 2,761,058 last year.

STOCKS AND SHARES.

TUESDAY EVENING.

STOCK EXCHANGE markets are changing their mood daily, but the balance of favour lies with holders of shares, and, amongst industrials the tendency is upward as a whole. Dearer money makes little difference to the speculator, although the gilt-edged markets are feeling its effect, and after a spurt in war stocks, prices soon began to crumble again. The volume of new issues was stemmed only temporarily, and the rush has set in to get as many newcomers as possible before the public on this side of Christmas.

Home Railway stocks are beginning to wake up again; their lethargy at last pierced by the investor's attention being directed to the yields offered at existing levels. The electric group is quiet. Metropolitans rose a point. Advertisements of what the cost of new equipment will be to the Underground Electric Railways have caused speculation as to how the money is likely to be raised. The Income bonds and the £10 shares are lower. It is thought that the North-Eastern may also require further funds if rumour is correct in stating that the company contemplates electrification of its main line from Newcastle to York.

The board of the Newcastle-on-Tyne Electric Supply Co. issue a defence of their proposal to create 7 per cent. preference shares that shall rank in front of the existing 5 per cent. preferences. The explanation may be reasonable and logical, but any business man knows that even the semblance of interference with what is regarded as security has seldom any good effect. There has been surprise at the suggestions of the Newcastle Co., and however misguided the sentiments may appear to the directors, it cannot be deemed unnatural on the part of holders of the existing preference shares. Meanwhile, the ordinary and preference are a weak market at 18s. and 15s. respectively. Underwriting has been in progress this week for the new issue of 7 per cent. preferences.

Dealings in Edison-Swan new shares began on the basis of 1s. to 1s. 9d. premium. Sales by the stag brigade caused a slight recession, and the price is now called 22s. 3d. to 23s. for the shares 21s. 6d. paid. The manufacturing list keeps hard. General Electric ordinary are in quiet request up to 22s. It is recalled that some kind of "news" was expected in the early autumn, but nothing transpired at that time, and curiosity is now fitting various ingenious theories to what may be in the wind to account for the present demand for the shares.

The Stock Exchange is already starting to discuss the new basis of taxation that is to be propounded in March or April next. Some men profess to have knowledge of the rough details. Excess profits duty goes. No doubt exists on that score. If a substitute is imposed on the lines now talked about, its incidence will be as unexpected as the fall of 10s. per ton in the price of coal. Unless, of course, the news leaks out so well in advance as to lead to a general overhauling and re-arrangement of capital accounts on the part of companies and private firms alike. Rumour and gossip have a fine field for fancy, and they hint darkly at a capital levy under a less repugnant name.

The unexpected news of a reduction of 10s. per ton in coal has not helped electricity supply shares. City of London ordinary improved beforehand, on expectation of an increased dividend, but other shares are heavy. Falls have occurred in County ordinary, Bromptons, Metropolitans, Charing Cross and Westminsters. The dulness is ascribed to the way in which the Government is apparently shaping the course of the Electricity Bill. One has to say apparently because of other possible surprises which may be in store.

At the meeting of the Aladdin Renew Lamp Corporation, the proceedings wound up with a kinema exhibition of the way in which the company pursues its business of repairing or renewing a broken filament in an electric lamp bulb. The precedent opens up a wide vista. Shareholders in rubber companies might be shown pictures, accelerated, of the latex trickling down the bark of the trees. The oil speculator might see the gushers of his dreams. The——but in a serious column, such fantasies are perhaps inappropriate, however much they provoke imagination. At all events, the idea seems quite a good one, and worth following up by other companies.

Anglo-Argentine Tramways have come down from the best on the official statement given here last week to the effect that the question of paying arrears of dividend is not under consideration. "The prospects of the company are dependent upon a revision of tariffs which has not yet been authorised by the authorities," says the London manager. It may not require a Sherlock Holmes to read, between these Anglo-Argentine Tramways lines, a pretty direct annoyance that somebody's tongue should have wagged rather too prematurely in this matter. Shareholders will not mind waiting, however, with this consolation to cheer them, for the necessary authority to be granted for revision of rates. Brazilians are all strong, because of the movements in the milreis, and even Mexicans look a trifle less dismal than they have done for the past six weeks, although the marking-down process is still going on.

Cable shares are a trifle irregular. Eastern Extensions went back ¼, while Eastern ordinary gained 2½ and Western shares put on 10s. Marconis are keeping fairly close to 6. Americans hardened to 33s., to lose sixpence of the advance. Callenders are dullish, but India-Rubber shares at 18s. are another 5s. higher. Improvement in the dividend on Telegraph Constructions is being discussed as a possibility. Siemens at 28s. and Electric Constructions at 23s. 9d. have declined. The Scottish selling of British Aluminium does not seem to be quite finished yet. Castner Kellners are unchanged at 2½, in spite of the fall in the dividend from 20 per cent. to 13 per cent.

Shares in coal, armament and other companies closely connected with the coal industry have been barely influenced by the coming drop in the price of the mineral. Babcock & Wilcox are 1-16 lower, but this has nothing to do, of course, with coal. Rubber shares are fairly firm; the product has risen to 2s. 5½d. per lb., and some of the producing companies have this week arranged contracts running into 1922.

SHARE LIST OF ELECTRICAL COMPANIES.

HOME ELECTRICITY COMPANIES.

	Dividend 1917.	Dividend 1918.	Price Nov. 25, 1919.	Rise or fall.	Yield p.c.
Brompton Ordinary	10	8	5⅝	— ¼	£7 2 3
Charing Cross Ordinary	4	4	8	—	6 8 0
do. do. do 4½ Pref.	4½	4½	3	—	7 10 0
Chelsea	5	3	3	—	5 0 0
City of London	8	8	11⅞	+ ⅛	6 17 8
do. do. 6 per cent. Pref.	6	6	9½	—	6 9 9
County of London	7	7	9¾	— ¼	7 11 4
do do. 6 per cent. Pref.	6	6	9⅝	—	6 9 9
Kensington Ordinary	7	6	4⅞	—	6 6 4
London Electric	Nil	Nil	1½	—	
do. do. 6 per cent. Pref.	5	6	5⅞	—	8 17 10
Metropolitan	4	5	3½	— ¼	7 13 10
do. 4½ per cent. Pref.	4½	4½	3⅝	— ⅛	7 4 0
St. James' and Pall Mall	9	10	6¼	—	8 3 4
South London	5	5	2½	—	7 8 6
South Metropolitan Pref.	7	7	1	—	7 0 0
Westminster Ordinary	9	8	5½	— ¼	7 5 6

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	6	6	91	—	6 11 8
do. Def.	1½	33/6	22	—	7 11 0
Chile Telephone	8	8	6½	—	6 3 1
Cuba Sub. Ord.	7	7	10½	—	£6 13 4
Eastern Extension	8	8	16⅝	— ¼	£4 15 7
Eastern Tel. Ord.	8	8	16⅝	+2½	£4 15 0
Globe Tel. and T. Ord.	7	8	16½	+ ½	£4 17 0
do. do. Pref.	6	6	10½	—	5 17 1
Great Northern Tel.	22	22	26⅝	—	8 6 0
Indo-European	13	13	48½	—	6 13 4
Marconi	20	25	5½	— ⅛	4 4 4
Oriental Telephone Ord.	15	10	2	— ⅛	4 14 1
United R. Plate Tel.	8	8	7½	—	£5 2 5
West India and Panama	1/3	1/3	1⅞	—	Nil
Western Telegraph	8	8	17½	+ ½	£4 11 5

HOME RAILS.

Central London Ord. Assented	4	4	58½	—	6 16 9
Metropolitan	1	1½	24	+1	5 4 2
do. District	Nil	Nil	21¼	—	Nil
Underground Electric Ordinary	Nil	Nil	2⅛	— ⅛	Nil
do. do. "A"	Nil	Nil	7/-	—	Nil
do. do. Income	4	5	88½	—1	£5 13 0

FOREIGN TRAMS, &c.

Adelaide Sup. 6 per cent. Pref.	6	6	4¼	—	7 1 2
Anglo-Arg. Trams. First Pref.	1½	Nil	3¼	— ⅛	—
do. do. 2nd Pref.	—	—	3½	—	—
do. do. 5 Deb.	5	5	66⅞	—	7 4 0
Brazil Tractions	—	—	62	+1½	—
Bombay Electric Pref.	6	6	13⅝	+1	4 9 0
British Columbia Elec. Ry. Pfce.	5	5	57	+1	8 18 6
do. do. Preferrred	Nil	2⅜	46½	—	5 7 6
do. do. Deferred	Nil	Nil	41½	—	Nil
do. do. Deb.	4½	4½	61	—	6 19 4
Mexico Trams 5 per cent. Bonds	Nil	Nil	46	—2	Nil
do. 6 per cent. Bonds	Nil	Nil	35	—	Nil
Mexican Light Common	Nil	Nil	25	—	Nil
do. Pref.	Nil	Nil	39½	—	Nil
do. 1st Bonds	Nil	Nil	54½	—	—

MANUFACTURING COMPANIES.

Babcock & Wilcox	15	15	3⅞	— 1/16	£4 14 4
British Aluminium Ord.	10	10	1⅝	—	6 3 1
British Insulated Ord.	25	12½	2⅛	— 1/16	6 1 1
Callenders	25	25	8½	— ¼	7 10 6
,, 6½ Pref.	5	6½	5	—	6 10 0
Castner Kellner	25	20	2⅜	—	7 12 8
Crompton Ord.	7	10	21/6	—	9 6 0
Edison-Swan, "A"	—	10	1⅞	—	8 8 6
do. do. 5 per cent. Deb.	4	5	81½	—	6 2 9
Electric Construction	10	10	1⅞	— 1/16	8 8 5
Gen. Elec. Pref.	6	6½	21/	—	6 10 0
do. Ord.	10	10	2	—	£5 0 0
Henley	25	25	2½	—	5 11 1
do. 4½ Pref.	4½	4½	3⅝	—	6 4 2
India-Rubber	10	10	18½	+ ½	£5 8 1
Met.-Vickers Pref.	—	—	3	—	5 6 8
Siemens Ord.	—	10	28/-	—3d.	£7 2 10
Telegraph Con.	20	20	25	—	£4 17 0

* Dividends paid free of Income Tax.

THE NEW INDUSTRIES IN CHINA.

The Opportunity for British Firms.

By Prof. MIDDLETON SMITH, M.Sc.

A few days ago the writer met a friend, a man with almost an international reputation in geology, who quite startled him by expressing surprise at the news that coal is being mined in British Malaya. As a matter of fact, all of the State railways in that country are burning local coal—not coal of very high quality, but useful; it is known as "Rawang." Probably the output of the mines is about 700 or 800 tons a day, but it is noticeable that the most up-to-date machinery is used in connection with this new industry. Orders have been placed with electrical engineering firms in this country, and, no doubt, this example will have an effect in districts far beyond that in which the railways run. For the Chinese are the real pioneers in Singapore and the Federated Malay States, as well as in the Dutch East Indies. It is the custom with these people to keep closely in touch with their relatives in China, and, indeed, to visit them as often as possible. Already they have produced a profound effect upon the leaders of this nation which had not stirred for thousands of years; but, of course, it must take some time for these new ideas to penetrate inland. At present the tide of progress affects chiefly the coast ports of Malaya, Siam and China.

The Cotton Industry.—In the minds of most British merchants, China is connected with piece goods, and it is still a very great market for sheetings and shirtings, &c., but what many people do not realise is, that it is inevitable that new industries will be initiated in Asia, and that trade of the future will be with the machinery of manufactured goods rather than the articles themselves. In this connection, a glance at the history of the cotton-spinning industry in China will give evidence of the modern tendency. In the early days there were three grades of native cotton known to the trade. These were grown in Kiangsu and Chekiang provinces, and in a small portion of Hupeh—altogether there were 379,000 spindles in operation, of which over 260,000 spindles were in Shanghai. From 1895 to 1900 the supplies for these local mills were native cotton supplemented by raw material from India. During this period the mills had a total of 379,000 spindles, whereas in 1919 the total is given on most reliable authority as 1,409,000. Cotton mills are springing up in Shanghai and Japan. During the war 1,300,000 spindles were ordered from England. Only 150,000 were delivered. It is worth noting that 300,000 spindles were ordered from America, and 300,000 were delivered. It is believed that 100,000 spindles from England will arrive in 1919, and 1,000,000 in 1920. It is quite obvious that for the equipment of these new mills a great deal of machinery must have been purchased, and those which are most up to date, naturally, use as much electrical apparatus as is possible.

Japanese Competition.—It is to everybody's advantage to study the question of Japanese competition. There is no denying the fact that the Japanese have advanced at the expense of British merchants and manufacturers during the war, and when these advances are legitimate, no one should complain. Under the peculiar circumstances caused by the war, the advances were, indeed, quite natural, and there is any amount of room in China for the three nations now chiefly interested in the trade of the country, namely:—Great Britain, America and Japan. In the cotton industry Great Britain was passed by Japan during the war, and the figures are, perhaps, worth quoting. Taking the nearest millions, we find that in 1913 the relative positions of Great Britain, U.S.A. and Japan were in the ratio of 51, 9, and 23. In 1918 they were in the ratio of 31, 1, and 50. Of course, nobody expects that Japan will go back to the position of 1913, but in this industry, and particularly in connection with the import of machinery, it is believed that Great Britain, during the next five years, will more than regain any ground in China that she has lost during the war. During her phenomenal development Japan has been a good customer for British machinery, and even to-day there are many firms in this country who obtain good orders from Japan. No sane person wishes to restrain the commercial development of this nation.

What British engineers complain of mostly in the Far East, especially in connection with electrical goods from Japan, is the quality. It is very much better that the Chinese should not use electrical goods at all, than that when they do commence to use them they should become disgusted at the value they receive. Many cases have been brought to the notice of the writer during the last five years in which Japanese wires, to take one example, have been installed for wiring purposes, and have very quickly depreciated. It is characteristic of the Chinese that they like a place to be flooded with light. The London restaurants have almost a dim and subdued appearance after one has been used to the glare of the Chinese palaces of joy. In Hong-Kong and Canton the blaze of artificial light in public restaurants continues for, perhaps, eight or nine hours. The rich Chinese are ideal customers for a lighting load, although it will take some education to persuade them to become as enthusiastic users of electricity for power purposes. But if they spend money on installation work in their houses, or in electricity supply schemes, and find that, owing to the poor quality of the materials used, there is constant need for repairs, they become disgusted. That is the complaint that British engineers make in connection with Japanese electrical supplies, and it is perfectly fair to criticise any nation which damages trade in that way. No doubt the Japanese themselves are beginning to realise this, and we can only hope that the very indifferent material which has come from their factories during the war will be replaced by something better. In that case, of course, prices must be higher; and, finally, no doubt, British firms will successfully compete. But the British in China say that wherever it is possible to do so the Japanese shut the door in the face of legitimate competition. Their conduct in Manchuria and Korea, for example, in connection with the railways, is cited as evidence of how the dice are loaded in favour of the Japanese trader in the Far East.

"*Getting Together.*"—One effect of the war upon Britons all over the world has been to draw them closer together.

The outstanding impression of the engineering industry in this country made upon the writer during the last five months has been the tendency towards amalgamations of interests.

Scarcely a week goes by that some new absorption does not take place, and one result seems to be a very much better organisation for mass production. Obviously, it must be better for one large firm to use a large works to make, let us say, direct-current motors, and generators of sizes from 10 to 200 kw., rather than to make all sorts and conditions of direct and alternating-current machinery, in the same works. If the same firm has some other works where it makes, let us say, alternating-current machinery, or some other speciality, that also can be worked in with the whole organisation in an economical manner. There seem to be at least three very large firms in this country which are willing to undertake the complete electrical installation for new central stations of almost any dimensions, and no doubt some of the other firms have arrangements of a friendly nature, whereby any one of them could undertake a similar contract. That is, of course, the American system, and while critics may say that it kills individual enterprise, and tends towards standardisation, at any rate the good effect is cheapness of production.

This tendency of "getting together" is noticeable in the trade organisations, such as the British Electrical and Allied Manufacturers' Association, which does such valuable

work for the industry. Naturally, only those in executive positions know the details of the most valuable work, but it would be most unfortunate if such trade organisations did not continue to be active. The latest, and perhaps, most powerful, seems to be the Federation of British Industries, to which most of the trade associations are now affiliated.

In China this tendency of "getting together" has also been noticeable. This year there is to be a conference in Shanghai of all of the British Chambers of Commerce, a total of 17. These represent British interests in the following ports, namely:—Hong-Kong, Tientsin, Hankow, Pekin, Chungking, Changsha, Chinking, Chefoo, Harbin, Moukden, Newchang, Tsinanfu, Foochow, Amoy, Swatow and Canton. This is the first time in the history of British enterprise in the Far East that British merchants from most of the important centres of trade will meet together in council. They will discuss not only leading business problems which affect their interests, but they will also draw up a programme of future policy. With the exception of Hong-Kong, all of these Chambers have come into existence since the war. The Hong-Kong Chamber dates back to 1861, and while essentially a British body, it admits to membership "all mercantile firms and persons engaged or interested in the trade of Hong-Kong or China" if they are elected at the annual general meeting by a majority of votes.

That is probably a wise provision in Hong-Kong, where there must always be a very large majority of British members of the Chamber of Commerce, and where the local Legislature can safeguard British interests.

This new conference is particularly gratifying to the writer, because it was one of the three things suggested by him about two years ago, and through the medium of the Press. It was an obvious suggestion, but previously he had never heard it mentioned. He now ventures to hope that in the course of time engineering problems will come prominently before the conference.

The New Aeroplanes.—The imagination of the public has been stimulated by the big deal in aeroplanes which has been made with the Pekin Government. It is probable that this is merely an earnest of much bigger schemes of development of communication in China. In general it is very much better for the Peking Government to borrow money from British investors at a high rate of interest for the purchase of aeroplanes, than to spend large sums upon fighting or retrograde schemes. Some of us, perhaps, would have much rather that the money had been spent upon other methods of communication; and even now we may hope that the Peking Government will borrow more and more for that purpose. For it is a strange thing, and it can be said with conviction, that it is finally a very good thing indeed—both for China and for British industry—if the Chinese borrow money for industrial schemes. That usually means British supervision, which in turn provides efficiency which is not obtained otherwise. An historic example of the good effects of this system is to be found in the "Maritime Custom Service" and the "Salt Gabelle."

But in any country the new industries, such as cotton mills, mines, &c., are always better undertaken by individual interests rather than by Government. Therefore, let us hope that some system will be devised whereby British finance, machinery, and brains can be used in the development of China. At any rate, it is encouraging to know that at least one of the best-organised concerns in the electrical industry has definitely made up its mind to do its utmost to extend its trade in the Far East. There are difficulties in that part of the world which are peculiar, and in the solution of which the long experience of the British merchant seems to be invaluable. The writer is able to say that the best among the British merchant houses in China have given considerable attention to this matter of the engineering development of the country. They have been convinced, during the last four or five years especially, that they must adopt new methods. The writer is most anxious to bring about co-operation between associations in China which are at work on behalf of British industry in the Far East and the trade organisations in this country which are exploiting the possibilities of overseas markets. For although there are plenty of orders in Great Britain just now, we must prepare for the work of a few years hence.

The development of the vast natural resources of China can only be accomplished with the goodwill of the Chinese, with modern methods of transport and with efficient machinery. The two great problems of Europe and China are supplementary. For Europe needs a fast market for manufactured goods, especially machinery, and China is the potential market. The immediate need is to extend the general knowledge of engineering science in official and influential circles in China.

THE INTERNATIONAL MOTOR-CAR EXHIBITION.

Concluded from page 668.

The exhibition showed that electrical systems have been improved, and the building of the dynamo and engine-starting motor into the engine as far as possible and not hung on is becoming more general. The unit system of motor-dynamo is not favoured to any great degree on English-built cars. There is scarcely one English car on which the dynamo is driven positively; leather belts are still employed universally, and in many cases no provision is made for belt adjustment. French practice, however, is to drive the lighting dynamo either positively, the drive being enclosed and automatically lubricated, or else by chain. The respective electrical components are much neater than they used to be, and their effectiveness has been improved. Cables are now neatly disposed and well armoured, and the lamps themselves are stream-lined to suit the general lines of the car. A greater range of adjustment for the headlamps is needed, while a tell-tale on the instrument board would save the driver some anxiety if it were worked in conjunction with the tail lamp.

The Coventry Chain Co., Ltd., Spon End Works, Coventry, was showing types of inverted tooth chains made in several pitches and widths for auxiliary drives to automobiles, such as camshaft, magneto, self-starter, lighting sets, and gear boxes. A selection of roller chains was also shown.

G. T. Riches & Co., Ltd., 19, Tottenham Court Road, London, W.C. 1. This exhibit comprised a collection of motor-car accessories of all kinds, and included starter batteries for American cars, electric lamp bulbs (Mazda, Osram, and Pope) of various types and sizes for car lighting, and a working exhibit of Fellow's magnetos, made by Fellows Magneto Co., Ltd., Cumberland Avenue, Park Royal, N.W.

Simms's magneto sets for Ford cars were also shown; these magnetos are manufactured by Simms's Motor Units, Ltd., Percy Buildings, Gresse Street, Rathbone Place, London, W. 1. The advantage claimed for this form of magneto, which is fitted with patent extended pole shoes, is the high efficiency obtained in all positions of the timing lever, a full-sized spark being produced at all ranges of ignition.

Lithanode, Ltd., 190, Queen's Road, Battersea, London, S.W. 8, had a collection of batteries on view, which included portable car-lighting and stationary accumulators, accumulator head lamps, head, side, tail and interior motor-car lamps, and dry ignition batteries.

W. Canning & Co., 18-20, St. John's Square, Clerkenwell, London, E.C. 1, exhibited a low-voltage dynamo for electro-plating, motor generators, regulating resistances, &c., as well as other plating appliances and polishing lathes, grinders, and similar machines.

Mr. A. Picard, 4, New Burlington Street, London, W. 1, exhibited silent chain-driven timing gear, with tension adjustable from the outside and P-R self-contained dynamotors; also lighting magnetos, lamps, horns, and other electrical fittings. Mr. Picard is sole agent for Great Britain and the Colonies of the Societe de Paris et du Rhone, whose works are at 41, Chemin de Saint-Priest, Lyons, France. The Paris-Rhône self-starting and lighting set consists of the dynamotor, a single unit assuring the starting and lighting, and the following principal accessories: a contactor disjunctor, switchboard with volt and ammeter, side and head lamps, leads, and battery. The dynamotor is a double acting device, which, after having started the engine is driven by it and becomes a dynamo with limited output, providing the lighting of the car and recharging the accumulators. It is built in two types suitable for various sizes of cars, and gives 15 or 16 amps. at 12 volts.

The contactor-disjunctor makes or breaks, according to re-

quirements, the machine-battery circuit. It is the automatic intermediary that ensures the starting of the engine or the recharging of the storage battery. It is sufficient, to start the engine, to press with one finger on a simple button switch on the switchboard. The switchboards are of two types, consisting of one lighting switch, one starting button, one voltmeter, one ammeter, one contact switch (switching the magneto to earth), one locking key; or one lighting switch, one ammeter, and one starting button. The Société Paris-Rhône is manufacturing, besides the two above-

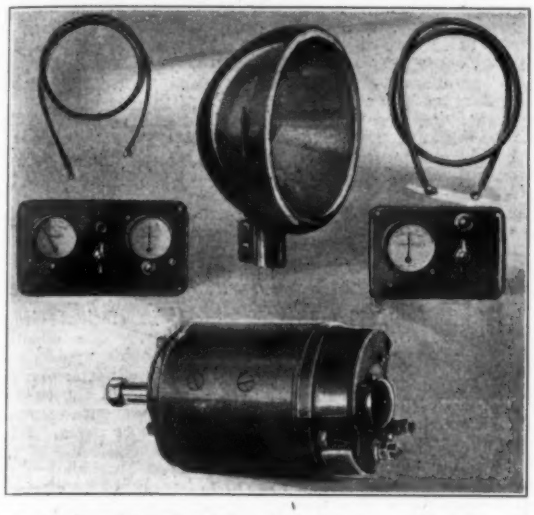


Fig. 7.—Paris-Rhone Electric Starting and Lighting Set.

mentioned types, special equipments as starters and lighting sets for small cars, and also equipments with separate units, dynamos and starters, especially suitable for certain types of chassis. The company's lighting magneto is simple and strong, and is suitable for lighting cycle-cars and industrial vehicles. The company also manufactures electric horns and instruments of all types in connection with electric equipment for motor cars. During the war the society specialised in the construction of equipment and instruments for wireless telegraphy.

Barimar, Ltd., 10, Poland Street, Oxford Street, London, W. 1, exhibited samples of welded metals by several welding processes and welding apparatus used for repair work. An interesting X-ray device was also shown, by means of which a photograph of a welded joint is taken in such a way that the whole substance and, therefore, it is claimed, the success or failure of the weld can be seen.

The Telegraph Condenser Co., Ltd., Vauxhall Street, Kennington Oval, London S.E. A speciality of British invention was the "Radamax" spark indicator and plug tester, which is claimed to indicate the position of trouble at once and without the necessity of removing the plug. In this device, fig. 8, advantage is taken of the fact that when a spark occurs at the plug points the electrical pressure varies with extreme rapidity. The tester responds to these variations, but not to the comparatively slow impulses which are set up by the magneto when no spark occurs at the plug. To test a plug it is only necessary to make firm contact so that one terminal touches the top and the other the base of the plug. If the plug is sparking in the cylinder, a spark will be seen at the other end of the instrument.

Pritchett & Gold and Electrical Power Storage Co., Ltd., 12, Heddon Street, Regent Street, London, W. 1, exhibited automobile accumulators for ignition, lighting and starting purposes, as well as switchboards for battery charging and electric inspection lamps.

Powell & Hanmer, Ltd., Chester Street, Birmingham, had on view generators and dynamotor combined starting and lighting sets. The dimensions of the latter type are 11 in. long, 7 in. high, and 5⅛ in. wide, the cut-out being integral with the machine and mounted in the brush bracket. The output on the dynamo side is 8 amps. at 5 to 12 volts at 1,800 r.m.p., and on the motor side if the latter is geared to the engine in the ratio of 4 to 1 the initial torque is 65 lb. ft. The patent clutch is 7.5 in. diameter and 2¾ in. wide, its function being to form the gear ratio for the motor and the speed governor for the engine. Batteries and lamps were included in the exhibit.

E. Kalker & Co., Coventry. This exhibit consisted of insulated wires, cables and flexibles of all descriptions, including insulating tape, special h.t. and l.t. rubber and braided ignition cables, and cables made in accordance with the specification of the British Engineering Standards Association.

Rotax Motor Accessories Co., Ltd., Victoria Road, Willesden Junction, London, N.W. 10, exhibited starting motors, lighting dynamos, batteries, switches, switchboards and a combined lighting and ignition unit similar to the C.A.V. machine. Amongst the car comforts such articles as telephones, roof lamps, and cigar lighters were included.

British-made magnetos of several types were shown in operation, and they reflect great credit upon the concerns that have developed them. The British Thomson-Houston Co., Ltd., Coventry, exhibited several types of machines, a feature of which is that a metal, in place of carbon, distributor brush is used. Instead of the h.t. current passing directly through the brush it jumps in the form of a spark across a small air gap, thus "tracking" is eliminated and it is rarely necessary to remove the distributor for cleaning. The M-L Magneto Syndicate, Ltd., Coventry, specimens are claimed to be lighter and more efficient than pre-war models, and also capable of operating at higher speeds and of running for longer periods without attention. Several types were shown running at speeds of from 30 to 3,000

Fig. 8.—The Radamax Plug Tester.

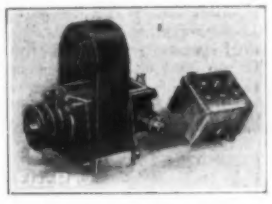


Fig. 9.—Midget Car Dynamo.

r.p.m., including one machine working entirely submerged in water. North & Sons, Ltd., Watford, manufactured magnetos in large numbers for aircraft, and the design has now been modified to conform with motor-car practice. The dimensions of these machines conform to the standards of the British Engineering Standards Committee.

Bleriot, Ltd., 58, Long Acre, London, W.C. 2, showed Ericsson magnetos, new models of self-starters and dynamos, English and French models of lamps, and motor-car telephones designed to give clear and loud communication from the inside of a motor car to the chauffeur without the latter's attention being distracted from the manipulation of the car. The set is designed to work on a 12-volt lighting set, and no induction coil is used, the receiver is fixed on the outside of the car near the ear of the chauffeur, and the instructions can be heard several feet away even in dense traffic, or when the car is travelling at high speed.

The Lucas Electrical Co., Ltd., Great King Street, Birmingham, had on view a full range of Thomson-Bennett magnetos, also lighting and starting as well as combined lighting and ignition sets. Fig. 10 shows the electric starter,

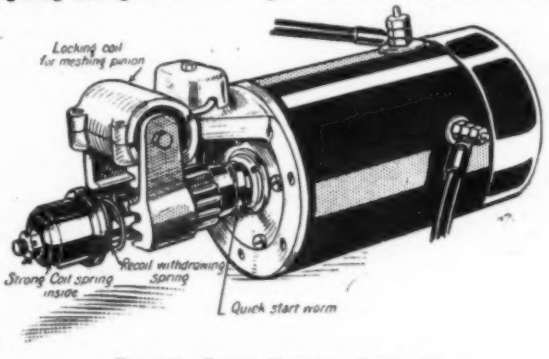


Fig. 10.—Lucas Electric Starter.

which ensures silent and shockless engagement of the starter pinion with the flywheel gear of the engine. Electric projectors, lamps, and switchboards were also on view.

Brolt, Ltd., Princip Street, Birmingham, exhibited three models of car-lighting dynamos, a new feature being a fan fitted to the armature for cooling purposes, and thus reducing size and weight. Three types of starting motors were shown; these were similar to pre-war types with the exception that the method of mounting has been improved. The switchboards shown were of two patterns only, namely, for flush and surface fitting. Accumulators and lamps were also shown.

The High Tension Co., 63, Belvedere Road, London, S.E. 1, exhibited sparking plugs, horns, magneto-testing apparatus, and "Mira" igniters either self-contained battery ignition or fitted to dynamos. This new ignition unit is an alternative to the magneto, and is interchangeable with it. The device comprises a h.t. transformer, distributor, and make-and-break, giving efficient results at small weight and cost. The "Mira" permanent-magnet dynamo, fig. 9, is a

small and cheap device suitable for motor-cycles and cycle-cars. It is made in two sizes to light three or five lamps at 4 or 6 volts. The carcase is made of interchangeable die castings, and the armature rotates on ball bearings. Owing to the use of permanent magnets the output is automatically regulated, and there is no fear of over-running it. No cut-out is employed between the dynamo and battery, and owing to the special armature winding very little energy is consumed. The dynamo should be run at 2,000 to 3,020 R.P.M., and it is desirable to switch it off when leaving the car standing for any considerable period.

A motor-cycle and cycle exhibition opened at Olympia on Monday and closes to-morrow, where electrical accessories are also to be seen. A number of motor-cycle sidecar combinations are now provided with electric lighting, for instance in the Matchless, where ignition is by H.T. magneto, a Lucas magdyno supplies energy for ignition and lighting in the electric model. In the new 8-H.P. Clyno a Lucas magdyno also supplies lighting as well as ignition; the accumulators for the former being carried under the sidecar seat, undoubtedly the best position, the large springs possible on sidecars being conductive to long life of the batteries. The 10-H.P. Reading Standard (American) is lighted by a Splitdorf generator carried in front of the engine outside the frame and driven by a spring belt. This is entirely independent of the magneto, and supplies energy to the 6-volt 15-amp.-hour Exide accumulators. Electric head and tail lamps and an electric horn form part of the standard equipment. The A.B.C. 3-H.P. horizontally-opposed machine is fitted with a neatly-mounted dynamo, which is housed in the aluminium bevel casing, and driven by a spur wheel from the gearbox main shaft. The accumulators are carried in a metal box on the near side of the machine close to the seat tube, the switchboard being mounted just above the dynamo. The whole outfit is of Lucas manufacture.

THE DESIGN OF MULTIPLE-STAGE AMPLIFIERS.

By PROF. C. L. FORTESCUE, M.I.E.E.

(*Abstract of paper read before the* Wireless Section *of the* Institution of Electrical Engineers.)

The simplest amplifying circuit is that shown in fig. 1. Here A, G, and F are the valve electrodes, the anode, grid and filament respectively. The filament temperature is maintained by current from the battery B_1 and controlled by the adjustable resistance R_1. A steady potential is maintained between the anode and filament by the battery B_2 the anode current passing through the anode resistance R_A. The small potential variations to be magnified are superimposed upon the steady voltage maintained by the battery B_3 between the negative terminal of the filament and the grid. These variations may be looked upon as being produced by a tiny alternator D, representing the input circuit. Under these conditions the potential variations consist of a rise above and fall

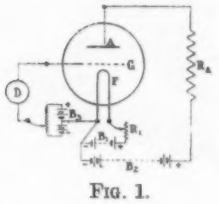


Fig. 1.

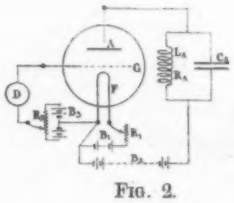


Fig. 2.

below the mean potential of the grid relative to the negative end of the filament. The changes of the grid potential are immediately followed by changes of the anode current, which in turn are accompanied by changes of the anode voltage due to the change of potential difference across the resistance R_A.

The curves of fig. 3 show these variations and their relative phases, it being assumed that the variations of potential applied to the grid are more or less sinusoidal in form and of constant amplitude. The relative values of the alternating component of the voltage across R_A and the alternating grid voltage give the voltage step-up of the valve and circuit.

With this arrangement of pure resistances throughout, the variation of the voltage across R_A can be made an exact reproduction of the variations of the grid voltage, provided that both are small compared with the range of voltage corresponding to the active portions of the characteristics. For low-frequency changes the conditions of the previous paragraph can be realised without difficulty. But capacity effects are serious at high frequencies (wireless frequencies) and the resistance R_A may be replaced by a condenser and inductance in parallel as in fig. 2, the circuit being accurately tuned to the frequency of the variations of grid potential.

To a sustained oscillation this circuit behaves in the same way as the resistance circuit of fig. 1. But to an oscillation of varying amplitude the behaviour is quite different. For example, during the first few cycles after the oscillation is applied to the circuit the current flowing round the circuit L_A C_A has not been built up to its normal value and the effective amplification is less than is the case at the later stages.

With a circuit such as that of fig. 2 the tuning of the condenser C_A becomes more and more critical as the resistance R_A decreases. The more critical the tuning the less will be the relative amplification at frequencies other than the fre-

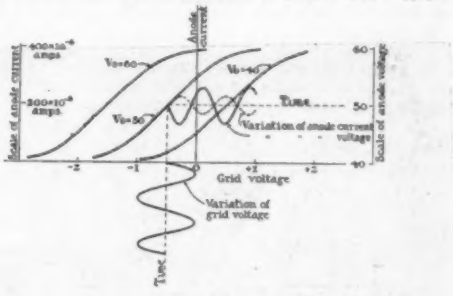


Fig. 3.

quency to which the circuit is tuned. An efficient circuit consequently leads to a selective amplifier. The effective damping of the circuit can be regarded as being made up of two parts, viz. (*a*) the resistance of the circuit itself; and (*b*) the equivalent resistance due to the resistance of the tube in parallel with the circuit. This latter component decreases with a decrease in the ratio of L_A/C_A and *vice versa*. With large values of L_A/C_A it constitutes the principal cause of the damping and may render the circuit almost aperiodic. Thus a circuit having a very high ratio of L_A/C_A cannot be efficient, and is the reverse of a selective amplifier.

In practice, where high selectivity is essential and tuning is not objected to, the efficient circuits may be used. But

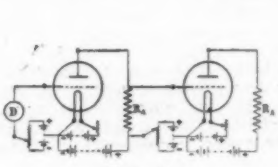


Fig. 4.

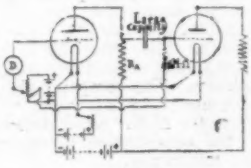


Fig. 5.

where approximately equal amplification is required over a wide range of frequencies, then a high ratio of L_A/C_A and a valve of low effective anode resistance would be used.

Multiple-stage amplification can be obtained with either of the arrangements of figs. 1 or 2, the anode-circuit voltage variations of each valve being applied to the grid of the valve next in the series, and so on. Fig. 4 shows a possible arrangement of two valves in cascade, using resistances in the anode circuit. Separate filament and anode batteries are required with this arrangement. In fig. 5, however, almost the same results are obtained without this disadvantage. A similar

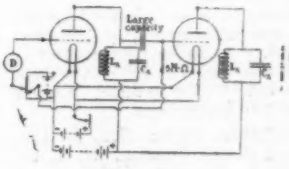


Fig. 6.

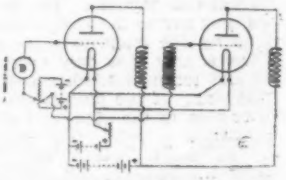


Fig. 7.

arrangement for two valves with tuned anode circuits is shown in fig. 6.

A cascade arrangement of valves with step-up transformers between the valves is another possible combination and is shown in fig. 7. When allowance is made for the self-capacity of the windings this circuit is very closely allied to that of fig. 6.

The action of any amplifying system, electrical, mechanical or otherwise, is strongly affected by any transfer of energy back from the output end of the system to the input end. With the amplifiers now under discussion, the transfer back of energy may be caused by any form of coupling between the output and input circuits. If this coupling is such that the changes at the input end are accentuated, it follows that changes of a given amplitude in the input circuit can be maintained by a smaller external power supply. In the extreme case the coupling may be strong enough to do more than maintain the changes at the input end. The system is then unstable, and if the circuits consist of inductances and capacities, oscillations will be set up and maintained. If there

are no inductances or capacities, the voltages and currents will steadily change in one direction or the other until the altered slope of the characteristic curves stops the action.

On the other hand, the coupling between the ends of the system may tend to oppose the changes at the input end. More power is required then from the external source to maintain the changes in the input circuit, and the effective amplification is reduced. Obviously, the greater the opposition coupling, the poorer will be the amplification obtained.

In an arrangement giving a high amplification ratio (say 1,000 to 1 on the voltage, *i.e.*, 10^6 to 1 on power) the transfer back of a very small proportion of the power from the output end to the input end will be sufficient to render the circuits unstable, or to reduce the amplification very considerably.

It is thus a matter of the very greatest importance to secure an adequate control of the coupling between the low-power and high-power ends of the instrument. This coupling may be capacity coupling, or a mutual inductive coupling, or a combination of the two. Resistance coupling may also be employed in conjunction with either capacity or inductive coupling. Capacity coupling is always present to some extent. At high frequencies it is always important and is generally the controlling factor. If inductive coupling is also used, the condition actually arrived at is a balance between the two.

Fig. 8 shows a method of using a capacity coupling, and fig. 9 a combination of inductive and capacity coupling. Both these systems are applicable to more than two valves, but the connections for the capacity coupling must necessarily be made to the right valves or opposition effects will be obtained.

In practice it is desirable that the action of the amplifier should not depend upon a very critical adjustment of this coupling. Consequently the unavoidable coupling must be reduced as far as possible. For high-frequency working, one

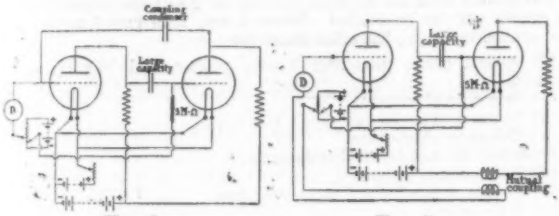


Fig. 8.

Fig. 9.

of the unavoidable sources of this coupling is the capacity between the grids and the anodes of the valves themselves. Formulæ are given in the paper by means of which the results of this coupling can be estimated in any particular case and its results allowed for.

A common method of designing an amplifier is to adjust it so that when the mean potential difference between the grid and filament has a particular value there is good amplification with a definite tendency towards the unstable condition. If an adjustment of the grid-filament P.D. is now provided, this tendency can be decreased or increased by making the mean grid-filament P.D. more positive or more negative. When more positive, the grid damping is increased, which increases the effective resistance of the circuits in which the oscillations are produced. Usually, also, the total amplification is somewhat reduced. Both these effects tend towards stability. If the grid is made more negative the conditions are reversed and the tendency to oscillate is accentuated.

There are two quite distinct ways in which reaction can be employed. In the first place, as has already been pointed out, the tendency to produce self-maintained oscillations enables currents of a given amplitude to be maintained in the input circuit for a smaller power supply from the external source. This is in itself equivalent to amplification. Under perfect conditions, with the reaction under perfect control, it would be possible to secure anything up to an infinite amplification by slowly increasing the power supplied back to the input circuit from the output circuit until the power required from the external source becomes vanishingly small. In practice, however, there are limitations. The control soon becomes very critical and the adjustment so delicate that the least change in the conditions in the valves upsets it. Also, unless all the valves are working on points on their characteristics where the amplification is a maximum, any momentary large disturbance will slightly increase the effective amplification and cause the self-maintained oscillations to set in. Thus amplification by "reaction," which in reality is merely using the amplifier to neutralise the resistance of the input circuit, must be reduced to a very moderate amount. The modern tendency is rather in the direction of avoiding it altogether if possible, the extra amplification required being obtained by using more valves in cascade.

In the second place, where continuous waves are being received by the heterodyne method, the use of a separate set of instruments to generate the beating oscillation is avoided if the amplifier can be so controlled as to generate these oscillations itself and yet maintain its power of amplification. Many amplifiers have been designed which serve the double function fairly well, but generally there is considerable loss of amplification and simplicity of operation. The loss of amplification arises from the fact that, once the beating oscillation is started in the input circuit, it immediately builds up to a value which is large compared with the incoming oscillation to be amplified. By the time that this large oscillation has been amplified by the whole series of valves, the voltage amplitude is such that for the last valves the grid voltage is coursing to and fro far beyond the limits of the slope of the anode-current characteristics. This difficulty is leading under modern conditions to the use of separate low-power generating sets for producing the beating oscillations.

Small irregularities in the action of the valves are due to two causes, viz. (*a*) the electron emission from the filaments is apparently not perfectly uniform; and (*b*) the amount and nature of the residual gas is not constant.

The result of these small irregularities is to cause small promiscuous changes in the anode currents of the valves near the input end of the amplifier. Each small change is amplified throughout the whole series and the aggregate gives rise to "valve noises," which constitute one of the most formidable obstacles to the attainment of very high amplification.

Any irregularity of either the filament heating battery or of the battery supplying the anode current will obviously be a source of trouble. A large capacity across the anode battery is often used to obviate this difficulty if the battery is not above suspicion. Batteries of a large ampere-hour capacity are used for the filaments for the same reason.

Anything of the nature of imperfect contacts must be scrupulously avoided.

In general, the current and voltage changes which are to be dealt with in amplifiers are small compared with the voltage range of the active portions of the characteristics. So long as this is the case the characteristics may be regarded as straight lines and the changes of current calculated from the observed slopes of the characteristic curves.

This procedure involves a fundamental assumption, viz., that the ordinary static characteristic is followed even at high frequencies and with minute amplitudes. It is difficult to see why the static and dynamic characteristics should not be the same. The fact remains, however, that it never seems possible to secure the amplification per valve that is indicated by numerical calculations from the static characteristics. With high-power transmitting valves a difference between the static and dynamic characteristics is fairly definitely established and appears to be due to surface changes of the filament. Whether some similar effect takes place in the low-power amplifying valves is a question that requires much further investigation.

The remainder of the paper consists of a mathematical investigation, which is not suitable for abstracting.

Electro-Plating.—In a paper read by Mr. O. P. Watts before the American Electro-Chemical Society it is recorded that it has been discovered recently that by immersing iron for a few moments in an acidified solution of arsenious oxide, an adherent copper-plate may be deposited from an acid electrolyte, but no adequate explanation had been offered for this unique effect of arsenic. In this paper it has been shown that certain solutions of lead and antimony may be substituted for the arsenic dip, previous to direct-current plating of copper on iron from copper sulphate.

It appears to be impossible to obtain a perfect plate on iron from solutions of bismuth chloride by the usual methods of electro-plating; but use of the arsenic or antimony dip is attended with the same success as in copper plating.

The successful substitution of solutions of antimony and lead for arsenic, and the application of these dips to plating on iron with bismuth, show that the beneficial effect of the arsenic dip is not due to a property peculiar to arsenic alone, but is the result of coating the iron with a metal whose potential in acid solutions is so near to that of copper that it is possible to deposit a good copper plate upon it, yet whose potential is not so far below iron that it will deposit on iron in a powdery, non-adherent form.

Large Generators.—Prof. Walter Reichel, at a recent meeting of the Association of German Engineers at Charlottenburg, read a paper dealing with the provisional limits in the construction of electrical machinery. He stated that notwithstanding the extraordinary development which had taken place in this branch in recent years, it seemed that a conclusion was far from having been reached. In future it was probable that alternating current would first come into consideration for the working of main lines, as with this system only 1,250 KW. was required in the power station for an output of 1,000 KW. on the locomotive, whereas 1,500 KW. was needed at the station with direct current for the same performance of the locomotive, the loss of energy in the latter case being very considerable. The pressure of the existing long-distance transmission lines was up to 150,000 volts, but it could be increased to 200,000 volts if required. In his opinion, it was quite possible to construct larger turbo-generators than those now made for the enormous output of 60,000 KW., as for instance generators up to 160,000 KW., of which a few would suffice to supply an area of several provinces. Large stations of 500,000 KW. could be built on the site of the coal fields in the Ruhr, Upper Silesia, and in Central Germany, although the time had not yet arrived for the erection of such larger stations.

THE GOVERNMENT AND TRADE.

[The Anti-Dumping Bill.]

On Wednesday, last week, the Government Bill relating to dumping of foreign goods and the setting up of an organisation to regulate importation, with a view to safeguarding certain British industries, was introduced by Sir Auckland Geddes. The Bill will form the subject of keen controversy both in political and industrial circles in the next few weeks. For the present we must content ourselves with the following extracts describing its main provisions :—

It is described as "a Bill to constitute a Trade Regulation Committee, to regulate the importation of goods with a view to preventing dumping, safeguarding key industries and industries affected by the depreciation of a foreign currency, assisting the revival of hop-growing, to regulate temporarily the exportation of certain goods, and to authorise the granting of credits and undertaking of insurances for the purpose of re-establishing overseas trade, and for other purposes incidental to the objects aforesaid."

The Committee is to consist of the President of the Board of Trade, the Financial Secretary to the Treasury, the Parliamentary Under-Secretary for Foreign Affairs, the Secretary of the Department of Overseas Trade (Development and Intelligence), the Permanent Secretaries of the Board of Trade, the Comptroller of the Department of Overseas Trade, and 10 members of the House of Commons, nominated by that House.

If the Board of Trade wishes to issue Orders under the powers conferred upon it under this measure, it will first submit them to this Committee for approval. In the case of urgency it will have authority to make a Provisional Order which shall not continue in operation for more than 21 days.

The second part of the Bill relates to the prevention of Dumping :—

(1) The Board on being satisfied—

(*a*) That goods of any class or description produced or manufactured in any country outside the United Kingdom are systematically and in substantial quantities being imported into or being sold or offered for sale in the United Kingdom at prices below the foreign value as defined by this Act or that there are good grounds for apprehending that such importation or sale is about to take place ; and

(*b*) That the production or manufacture of similar goods in the United Kingdom is or is likely to be thereby adversely affected,

may by order apply this part of this Act to goods of that class or description, if imported from or if made or produced in any country outside the United Kingdom, or such country or countries as may be specified in the order.

(2) Any such order may provide that goods to which the order applies shall not be imported unless there are produced a sworn declaration by the consignor stating the foreign value of the goods and the country of manufacture or production of the goods ; and a valid certificate from the proper officer that to the best of his knowledge and belief the statements contained in the sworn declaration by the consignor are correct ; and declarations and evidence on other matters.

While an order applying this part of this Act to any goods is in force, no person shall subject as provided import into the United Kingdom any goods to which the order applies, other than goods imported without previous sale, if the import price of the goods as ascertained by the Commissioners, is less than the foreign value of the goods as stated in such sworn declaration and certificate, provided that the importation of any such goods as aforesaid shall not be deemed illegal in any such case as aforesaid if the importer before the clearance of the goods pays to the Commissioners such sum as in the opinion of the Commissioners is equal to the amount by which the foreign value of the goods exceeds the import price thereof.

While an order applying this Part of this Act to any goods is in force no person shall, except as provided, on the first sale of any such goods which have after the date on which the order came into force been imported into the United Kingdom without previous sale, sell the goods at a price which is less than the foreign value of the goods provided that any such sale as aforesaid shall not be deemed to be unlawful if the vendor either—

(*a*) Previously to or within such time after the sale as may be allowed by the Board pays to the Board a sum equal to the difference between the price at which the goods are sold and the foreign value of the goods ; or

(*b*) Previously to the sale has satisfied the Board that the sale at the price at which the goods are to be sold is due to depreciation in the quality of the goods or to any other cause which it appears to the Board should be taken into account.

If any person sells any goods in contravention of the provisions of this section he shall be liable to forfeit such sum as the Board may demand not being greater than the value of the goods, and any such sum shall, without prejudice to the recovery thereof as a debt to the Crown, be recoverable by the Board summarily as a civil debt.

The Bill defines the meaning of "Foreign value," "Import price," and "Price on first sale."

Where goods are imported into the United Kingdom for the purpose of the use thereof as parts of, or in the manufacture of, any article assembled or manufactured in the United Kingdom by or on behalf of the consignor, and the price at which the articles so assembled or manufactured are being sold in the United Kingdom is less than the foreign value of such articles, this part of this Act may be applied to the goods so imported, subject to such modifications (to be specified in the Order) as appear to the Board to be necessary in order to adapt this part of this Act to the circumstances of the case.

Powers are included as to obtaining information and inspecting documents, &c.

Part III relates to the safeguarding of key industries, and industries affected by depreciation of foreign currency.

The Board may by order—

(*a*) Prohibit the importation of any or all of the goods specified in Part I of the Second Schedule to this Act or of any particular class or description of such goods ; and

(*b*) at any time within a period of three years from the termination of the present war prohibit the importation of all or any of the goods specified in Part II of the Second Schedule of this Act ; and

(*c*) on being satisfied that there has been such a depreciation in the sterling value of the currency of any foreign country as, not being adequately compensated by increased cost of production in that country, is causing or is likely to cause sales in the United Kingdom of the products or manufactures of that country to take place in substantial quantities at prices substantially below those at which similar articles manufactured in the United Kingdom can be sold, and that action under this provision is otherwise desirable, prohibit the importation of any class or description of goods manufactured or produced in that country.

There are provisions relating to licences, and to the power of the Board of Trade in the Second Schedule (referred to below). Part V of the Bill bears on the power of the Board of Trade to grant credits and insurance in certain cases for Overseas Trade. Part VI contains a number of general matters.

The Second Schedule contains the list of goods the importation of which may be prohibited. Items 1 and 2, in Part I, are dyes and synthetic drugs ; the other items are :—

(3) Optical glass, including lenses, prisms, and like optical devices.
(4) Scientific glassware.
(5) Illuminating glassware.
(6) Laboratory porcelain.
(7) Scientific and optical instruments.
(8) Potassium compounds.
(9) Tungsten powder and ferro-tungsten.
(10) Zinc oxide.
(11) Lithopone.
(12) Arc lamp carbons and carbon electrodes.
(13) Magnetos and permanent steel magnets.
(14) Hosiery latch needles.
(15) Gauges.

Part II of the Schedule specifies :—

(1) Thorium nitrate.
(2) Gas mantles and gas mantle-rings.

ELECTRIC FIRE ALARM AND POLICE-PATROL SIGNALLING SYSTEMS IN THE UNITED STATES.

Particulars have recently reached this country of a census taken in the United States in 1917 of municipal electric fire-alarm and police-patrol signalling systems, and the report points out that the importance of electricity as a time saver in announcing the existence and location of a fire can scarcely be over estimated, since it is self-evident that the more promptly a fire can be attacked by the firemen, the more easily it can be extinguished, and with the minimum of loss.

The history of fire-alarm telegraphy is short, but its progress has been rapid. Prior to 1850, even in the largest cities of the United States, there were no means of directing fire brigades, &c., to the scene of a fire beyond shouting alarms and striking bells. The use of the telegraph as a means of transmitting alarms was first suggested by Dr. W. F. Channing, of Boston, and in 1845 he published an article in the Boston *Advertiser* outlining a method in which the telegraph could be used for fire-alarm purposes. In 1852 the first fire-alarm telegraph system was installed in the city of Boston, and at the present day there are few cities in the United States that are not equipped with some system of the kind.

The simplest form of fire-alarm system, frequently found in smaller towns, consists of but one single circuit with a few signalling boxes on the line; at fire headquarters the only equipment may be an annunciator with a bell striker attached, and there may be a further connection with a town bell for alarming voluntary firemen who are not at headquarters.

A fire-alarm signalling box consists of a clockwork mechanism which when operated revolves a character wheel, and causes the normally closed circuit to be successively opened and closed at regular intervals.

A device used in the larger central fire-alarm stations for sending out alarms to engine and truck companies is a

manual transmitter. These transmitters are of two general types—the dial type and the button type. Some cities which do not have central offices at which operators are stationed at all times, have in the central station of their fire-alarm departments a machine called an automatic transmitter, the functions of which are to repeat automatically over all circuits any signal received from any one circuit.

The total number of public (as distinct from privately-owned) fire-alarm and police-patrol signalling systems in the United States in 1917 was 1,712, as compared with 1,397 in 1912, an increase of 22.5 per cent. The figure for 1917 was made up of 45 combined systems, 1,285 fire-alarm and 382 police-patrol systems. The miles of wire used in these services totalled 107,658 in 1917, as compared with 90,234 in 1912, while during the same period of five years the number of boxes or signalling stations increased from 81,282 to 94,853. Fire alarm calls increased by 28 per cent. in the period under review, reaching a total of 224,753 in 1917.

One of the improvements that has characterised the installation of signalling systems in America in recent years has been the placing of the wires in subways or conduits. The advantages, such as protection from storms and climatic conditions generally, are obvious, and in 1917 there were 176 cities in the United States, compared with 132 in 1912, having a population of 30,000 or more that reported fire-alarm and police-petrol systems, with a total of 50,254 miles of wire underground, an increase of 4,659 miles, or 10.2 per cent. since the census of 1912. Cities generally are now placing their wires underground, the largest individual increase in the five years being shown in Chicago, which had 2,328 more miles of underground wire in 1917 than in 1912. New York followed closely with an increase of 2,201 miles, while Syracuse and Detroit both showed increases of over 1,000 miles in the same period.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

An Electric Scooter.

A scooter novelty is being produced by the Runbaken Magneto Co., Ltd., of Derby Street, Cheetham, Manchester, whose experimental machine has, we understand, been inspected by a *Motor Cycling* representative. The frame of this machine, fig. 1, which bears only slight resemblance to the projected standard article, is of tubular construction and duplex so that a cradle is formed in the centre position. A motor-cycle saddle and footboards are provided; the wheels are intended to be 18 in. in diameter, although those shown below are only 12 in. The power plant of the machine con-

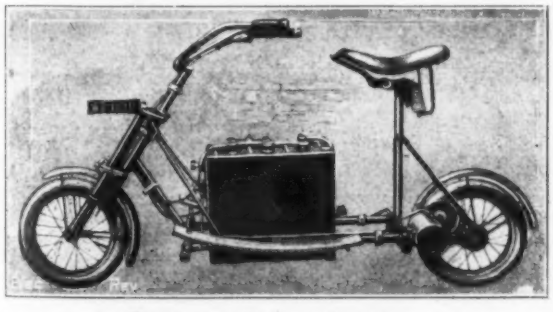


Fig. 1.—An Electric Scooter.

sists of a ½-h.p. electric motor, forming one unit with its reducing gear, bolted on to and projecting from the rear portion of the frame and driving the back wheel through a short chain. The motor will probably be later incorporated in the rear wheel. The battery, which weighs 1 cwt., and forms the bulkiest part of the equipment, is situated amidships, resting in the previously mentioned cradle. It will be fitted with a quick detaching device and rollers underneath, and also a charging plug on the frame so that the battery may be either removed or charge *in situ*. The controller is in the form of a twist-grip on the handle bar; the machine is said to attain a speed of 9 m.p.h. with a 12-mile radius on one charge of the 6-volt accumulators. No brake is fitted to the machine, but it is intended to provide a retarding effect by means of an easily-operated armature short-circuiting device.

The Multy-Kontact Accessories.

Several ingenious improvements in the construction of connectors, wall plugs, and sockets have been made by The Heavy Current Electric Accessories Co., of Park Road, Edmonton. The M-K socket, which is shown in fig. 2, consists of a hard-drawn brass tube B, which has a belled mouth A to provide easy access for the round pin of the plug. This sleeve or socket has a number of little springy tongues, C, which press upon the pin as it passes up the socket and thus ensure an excellent electrical contact. Fig. 3 shows the cylindrical nut D which, in conjunction with the set screw E, forms a very effective connection for the end of the flexible cable. Fig. 4 shows the connection made, and it is claimed by the makers that it is impossible to pull the wire and socket apart without breaking the wire.

Figs. 5 and 6 show in section and elevation a double connector fitted with the Multy-Kontact sockets, which are enclosed in a porcelain housing made in three parts, the wiring being extremely simple. The connector is provided

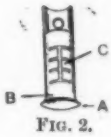


Fig. 2.

Fig. 3.

Fig. 4.

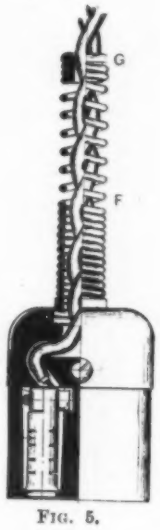


Fig. 5.

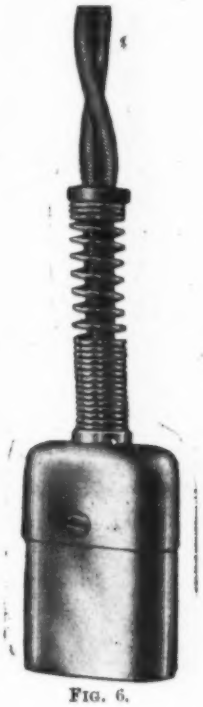


Fig. 6.

with a nickel-plated spring F to prevent undue wear, which ends in an insulating bush G. The interior of the connector is enclosed in a substantial nickel-plated sheath, giving a handsome finish to the device.

Sockets similar to that described above may be used in conjunction with a specially designed brass connector to form a simple and reliable socket for wall plugs, of very substantial construction, as shown in figs. 7 and 8. The socket C is clamped in a brass block A by a screw, and the leads are secured by two screws as at D. The pins of the plug are made

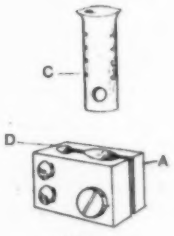


Fig. 7.

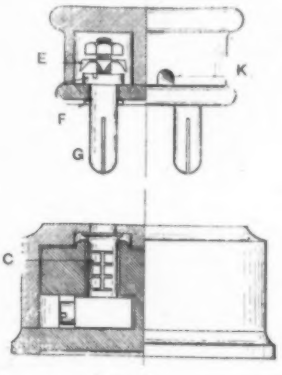


Fig. 8.

of full section through the base of the plug and in one piece, with a washer of special shape to prevent the flexible from spreading; the pin G is secured by a steel pin F in a groove in the front of the base, which also prevents the pin G from turning. The cover is of polished walnut, with a channel K at the side for the flexible.

The dimensions of the parts are those recommended by the Engineering Standards Association, and the design is calculated to ensure good contact and to enable large currents to be carried without heating, the connectors taking up to

12 amperes, and wall sockets up to 45. When the sockets are worn, they can easily be renewed at slight expense. These fittings are already being used on a considerable scale in connection with electric fires, irons, toasters, &c.

Mohawk Accumulators.

THE MOHAWK CYCLE CO., LTD., of 2-6, Alexandra Road, London, N.8, is marketing a 4-volt accumulator in sizes

FIG. 9.—MOHAWK ACCUMULATOR.

FIG. 10.—POCKET LAMP STORAGE BATTERY.

from 10 to 80 amperes, and a pocket lamp battery; the latter takes the place of the ordinary dry battery, and has the advantage that it can readily be recharged at small cost.

NEW PATENTS APPLIED FOR, 1919.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'DELL AND STEPHENS (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

27,627. "Distribution in alternating-current systems." A. M. TAYLOR. November 8th.

27,644. "Electric switch, &c., mechanism." C. L. WALKER. November 8th.

27,656. "Process for concentrating alternating-current arc, extended by direct-current magnet to suitable lengths, over small reaction area." H. ANDRIESSENS. November 8th.

27,706. "Suspension chains for electric lamps, fittings, cables and wires, &c." J. I. BALL. November 10th.

27,709. "Microphone." E. M. C. TIGERSTEDT. November 10th. (Denmark, November 8th, 1918.)

27,721. "Frequency meters." C. L. LIPMAN, NALDER BROS. & THOMPSON. November 10th.

27,771. "Oscillation generators of the arc type." WESTINGHOUSE LAMP CO. November 10th. (U.S., November 9th, 1918.)

27,796. "Switch for electro-medical application." A. V. LAW. November 10th.

27,804. "Electro-magnets." A. LUZY. November 10th. (France, February 1st, 1918.)

27,811. "Electrical insulators." G. V. TWISS. November 10th.

27,832. "Electrical automatic photographic machine." H. H. WOLFE. November 11th.

27,839. "Ceiling roses, &c., of electric lamps and means for controlling latter." H. E. HADWEN and H. WILLIS. November 11th.

27,858. "Generation transmission and distribution of electricity." W. H. HANSTOCK and H. HAWKINS. November 11th.

27,871. "Carriers for electric storage batteries." J. C. BLAKE and W. MCNAUGHT. November 11th.

27,903. "Combination of electric two-way switch and transformer." H. CLEETON. November 11th.

27,904. "Electric lighters." B. L. DECHELLE. November 11th. (France, March 22nd.)

27,905. "Electric time-transmitting apparatus." P. TRICHARD. November 11th. (France, July 13th, 1917.)

27,909. "Electrical signalling and order transmitting signals." C. V. USBORNE. November 11th.

27,914. "Starters for internal-combustion engines." A. H. MIDGLEY and C. A. VANDERVELL & Co. November 11th.

27,922. "Electric motor control." BRITISH THOMSON-HOUSTON CO. (General Electric Co.) November 11th.

27,933. "Apparatus for electrically-controlling air brakes." W. L. MELLERSH-JACKSON. (E. P. Waterhouse and B. A. Prince.) November 11th.

27,938. "Dynamo-electric machines." A. E. WHITE. (U.S. Light & Heat Corporation.) November 11th.

27,940. "Battery plates and plate-pasting machines." A. E. WHITE. U.S. Light & Heat Corporation.) November 11th.

27,941.—"Electric regulators." A. E. WHITE. (U.S. Light & Heat Corporation.) November 11th.

27,942. "Systems of electrical distribution." A. E. WHITE. (U.S. Light & Heat Corporation.) November 11th.

27,948. "Regulating switches of the multiple-contact type." M. MANSELL. November 11th.

27,950. "Wireless telegraph receiving system." W. J. PICKEN and J. G. ROBB. November 11th.

27,975. "Electric wheel tyres." BELDAM TYRE CO. November 12th.

28,006. "Electrically-operated sound-warning devices." L. CHOLLET and W. P. THOMPSON. November 10th.

28,029. "Trolley or collector wheels for electric tramways and railways." G. A. MITCHELL and G. F. POPPLEWELL. November 12th.

28,046. "Electric braking systems." BRITISH THOMSON-HOUSTON CO. (General Electric Co.) November 11th.

28,087. "Telephone receivers and ear-pieces therefor." R. L. MURRAY and TELEPHONE MANUFACTURING CO. November 12th.

28,100. "Sparking plugs." J. ATKINSON, R. ATKINSON, S. G. ATKINSON, and W. ATKINSON. November 12th.

28,107. "Electric illuminating devices for theatrical stages, &c." T. H. ROCHFORD. November 13th.

28,154. "Apparatus for electrical treatment of gases." INTERNATIONAL PRECIPITATION CO. November 13th.

28,157. "Alternating-current motors, &c." E. S. CAREY and CAREY-GARVEY SYNDICATE. November 13th.

28,160. "Measured service telephone systems." AUTOMATIC TELEPHONE MANUFACTURING CO. November 13th. (U.S.A., February 12th.)

28,188. "Accumulators." A. P. FORD and C. MILTON. November 13th.

28,240. "Electro-magnetic apparatus for steering vehicles." J. G. GRAY. November 14th.

28,246. "Automatic-controlling switches for charging accumulators." R. AMBERTON and J. R. WALTON. November 14th.

28,249. "Electrical device for holding cog on armature spindle of electric motor-starter whilst it is drawn into mesh with cog on flywheel of engine." R. H. LANE. November 14th.

28,250. "Electric signal-recording apparatus, &c." J. B. BOLITHO. November 14th.

28,251. "Receiving or recording telegraphic messages." J. B. BOLITHO. November 14th.

28,257. "Apparatus for amplifying and reproducing sound." A. W. SHARMAN. November 14th.

28,260. "Means for controlling operative field of magnets." L. W. GOULD (National Safety Appliance Co.). November 14th.

28,265. "Appliances for regulating hardness of Rontgen-ray tubes." H. F. EIKEN. November 14th.

28,280. "Relays for operating with high-frequency currents." A. C. BROWN. November 14th.

28,289. "Hypersensitive galvanometer." H. M. ROBINSON. November 14th.

28,291. "Couplings for magnetos." F. M. PADIAN and F. R. RAM. November 14th.

28,296. "Sparking plugs." J. A. MOREAU. November 14th. (France, August 6th.)

28,301. "Receivers for wireless telegraphy." C. T. HUGHES and L. B. TURNER. November 14th.

28,307. "Electric couplings." BRITISH ELECTRIC TRANSFORMER CO. and W. J. SIMS. November 14th.

28,313. "Electric switch devices for preventing stealing or use of motor vehicles." G. W. MALCOLM. November 14th.

28,315. "Electrical seam-welding machines." E. SCHRODER. November 14th. (Germany, June 8th, 1918.)

28,318. "Conductors for electric lamps, &c." G. HOLST. NAAMLOZE VENNOOTSCHAP PHILIPS GLOEILAMPENFABRIEKEN and OOSTERHUIS, E. November 14th.

28,320. "Thermionic or oscillation valves." S. R. MULLARD. November 14th.

28,322. "Electrical indicating devices." R. S. O'NEILL. November 14th.

28,324. "Magnetos." N. C. F. JENSEN and M. J. E. TILNEY. November 14th.

28,325. "Electric ignition apparatus for internal-combustion engines." N. C. F. JENSEN and M. J. E. TILNEY. November 14th.

28,330. "Thermionic devices." J. SCOTT-TAGGART. November 14th.

28,335. "Electron discharge devices, &c." J. SCOTT-TAGGART. November 15th.

28,369. "Electric relays." AUTOMATIC TELEPHONE MANUFACTURING CO. (Automatic Electric Co. and A. E. Hudd.) November 15th.

28,376. "Sparking plugs." W. H. BRAMPTON. November 15th.

28,383. "Holders for electric lamps." T. H. A. BROWN. November 15th.

28,384. "Regulation of voltage of dynamos." M. S. CONNER and C. C. PUCKETTE. November 15th.

28,386. "Fixing arrangements for electric measuring instruments, &c." SIEMENS & HALSKE AKT. GES. November 15th. (Germany, August 23rd, 1918.)

28,390. "Electrical heating devices." M. S. PARNELL-SMITH. November 15th.

28,393. "Combined magneto and dynamo-electric machine." EISEMANN MAGNETO CORPORATION and O. IMRAY. November 15th.

PUBLISHED SPECIFICATIONS.

The numbers in parenthesis are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1918.

13,473. REGULATORS FOR DYNAMO-ELECTRIC MACHINES. Remy Electric Co. July 10th, 1917. (118,630.)

13,474. REGULATING DEVICES FOR DYNAMO-ELECTRIC MACHINES. Remy Electric Co. August 18th, 1917. (118,631.)

16,549. APPARATUS FOR ELECTRIC WELDING. J. Crichton. October 11th, 1918. (133,935.)

16,653. PORTABLE ELECTRIC ACCUMULATORS. D. W. John and J. H. Berry. October 12th, 1918. (133,997.)

17,231. ELECTRIC ACCUMULATOR BOXES. A. A. Price. October 22nd, 1918. (134,016.)

17,349. MEANS FOR ELECTRICALLY SIGNALLING THE MOVEMENTS OF RECORDING INSTRUMENTS. A. Deane-Butcher and G. Kent, Ltd. (A. D. Deane-Butcher.) October 22nd, 1918. (134,018.)

17,258. GALVANIC BATTERIES. G. Oldham and J. Oldham. October 22nd, 1918. (134,019.)

17,337. MINERS' ELECTRIC LAMPS. L. Chomier. December 17th, 1917. (121,588.)

17,396. ELECTRIC TRANSFORMERS FOR WELDING. C. J. Holstag. October 24th, 1917. (120,886.)

17,639. SYSTEMS OF FREQUENCY TRANSFORMATION. British Thomson-Houston Co. (General Electric Co.) October 29th, 1918. (134,045.)

18,559. ELECTRIC MOTOR-CONTROL SYSTEMS. L. Miller, W. Brooke, and British Westinghouse Electric and Manufacturing Co. November 13th, 1918. (134,064.)

18,702. APPARATUS WITH HORIZONTAL DIAPHRAGM FOR ELECTROLYSIS OF ALKALINE CHLORIDES. Norsk Alkali Artieselskabet. April 25th, 1918. (125,935.)

19,099. MOUNTING OF ELECTRICAL APPARATUS IN FRAMES OR CASES. H. B. Prentice. November 21st, 1918. (134,076.)

20,374. HARDENING AND TEMPERING OF METAL WIRE BY ELECTRICITY. A. Imbery. December 7th, 1918. (134,098.)

1919.

1,650. ELECTRIC FURNACES. Soc. Electro Metallurgique. February 11th, 1918. (123,306.)

2,922. CONSTRUCTION OF DYNAMOS AND MAGNETOS. M. S. Conner and C. C. Puckette. February 6th, 1919. (134,139.)

2,962. IRON CORES FOR ELECTRIC TRANSFORMERS, INDUCTANCES, AND THE LIKE. J. S. Mollerhoj. February 6th, 1918. (123,096.)

4,268. DEVICES FOR CARRYING OUT CHEMICAL PROCESSES BY ELECTROLYSIS. V. Gerber. February 20th, 1919. (133,883.)

4,898. ELECTRIC HELM INDICATORS. Siemens Bros. & Co. and F. Turner. February 26th, 1919. (133,888.)

13,498. SAFETY-RELAYS ASSOCIATED WITH STARTING AND REGULATING APPARATUS FOR ELECTRIC MOTORS. E. Lindblom and Allmanna Svenska Elektriska Aktiebolaget. May 30th, 1919. (134,178.)